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Approval, Exhaust Gas Monitoring, and Safety Requirements for the Use of Diesel-Powered Equipment in Underground Coal Mines; Final Rule

DEPARTMENT OF LABOR

Mine Safety and Health Administration

30 CFR Parts 7, 31, 32, 36, 70, and 75

RIN 1219–AA27

Approval, Exhaust Gas Monitoring, and Safety Requirements for the Use of Diesel-Powered Equipment in Underground Coal Mines

AGENCY: Mine Safety and Health Administration, Labor.

ACTION: Final rule.

SUMMARY: This final rule establishes new requirements for the approval of diesel engines and other components used in underground coal mines; requirements for monitoring of gaseous diesel exhaust emissions by coal mine operators; and safety standards for the use of diesel-powered equipment in underground coal mines. The final rule is derived in part from existing MSHA regulations, and provides protection against explosion, fire, and other safety and health hazards related to the use of diesel-powered equipment in underground coal mines. The final rule also amends certain equipment safety standards in part 75 previously applicable only to electric-powered equipment to apply to diesel-powered equipment. The new standards are consistent with advances in mining technology, address hazards not covered by existing standards, and impose minimal additional paperwork requirements.

EFFECTIVE DATES: This regulation is effective April 25, 1997, except for subparts E and F of part 7, the removal of part 31, the amendments to part 36, and § 75.1907 which are effective November 25, 1996. Incorporations by reference were approved by the Director of the Federal Register as of April 25, 1997.

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SUPPLEMENTARY INFORMATION:

I. Background

Coal mine operators began to introduce diesel-powered equipment into underground mines in the early 1970's. The number of diesel units operating in underground coal mines has increased from approximately 150 in 1974 to over 2,900 units operating in 173 mines in 1995. MSHA projects that the number of diesel units operating in underground coal mines could increase to approximately 4,000 in 250 underground coal mines by the year 2000.

Although diesel-powered equipment does not have the inherent electrocution hazard of electric-powered equipment, it nonetheless presents a number of safety and health risks. By introducing an internal combustion engine into an environment where explosive levels of methane can be present, diesel-powered equipment brings with it risks of fire or explosion. Diesel engines also have high temperature exhaust components which, in the presence of coal and other combustibles in the underground mine environment, present a fire hazard. The handling and storage of diesel fuel underground also present potentially serious fire hazards. Finally, diesel engines produce exhaust gases containing carbon monoxide, oxides of nitrogen, and particulate matter, presenting potentially serious health risks to miners.

Before publication of this final rule, MSHA's regulations contained limited safety and health and machine approval requirements that specifically addressed the use of diesel-powered equipment in underground coal mines. In the 1980's, the increase of the numbers of this equipment in underground coal mines, coupled with the health and safety risks associated with its use, highlighted the need for a regulatory approach specifically tailored to diesel-powered equipment operated in underground coal mines.

In response to this need, the Secretary of Labor convened a Federal advisory committee in 1987 to evaluate and make recommendations for the safe and healthful use of diesel-powered equipment in underground coal mines. The Diesel Advisory Committee addressed approval issues—covering equipment design and performance; use issues—addressing the safe use of diesel equipment in the mine environment; and health issues—concerning the evaluation and control of health hazards associated with diesel equipment. In July 1988, the Committee issued a report of its recommendations entitled ''Report of the Mine Safety and Health Advisory Committee on Standards and Regulations for Diesel-Powered Equipment in Underground Coal Mines''. In its report the Committee concluded that MSHA should develop regulations to govern the approval and use of diesel-powered equipment in underground coal mines, and identified a number of specific areas to be addressed.

On October 4, 1989, the Mine Safety and Health Administration published a Notice of Proposed Rulemaking in the Federal Register [54 FR 40950] that included criteria for the approval of diesel engines and other related equipment; addressed exposure limits, monitoring, and recordkeeping requirements for certain diesel emissions; and provided corresponding safety standards for the use of diesel-powered equipment in underground coal mines, including the safe storage and transport of diesel fuel, and the training of persons performing work on diesel equipment. On the same day, MSHA also published an Advance Notice of Proposed Rulemaking [54 FR 40996] soliciting comment on the approach and scope of an MSHA approval program for diesel machines. MSHA held four public hearings on the proposed rule: in Salt Lake City, Utah; Pittsburgh, Pennsylvania; Chicago, Illinois; and Birmingham, Alabama.

This final rule, which includes specifications for the approval of diesel engines as well as provisions for the safe and healthful use of such equipment in underground coal mines, is derived from the data, information, and public comments compiled during the rulemaking process. The final rule, like the proposal, takes an integrated approach to the control of diesel safety and health hazards, requiring clean-burning engines on diesel-powered machines, maintained by persons who have been adequately trained for the task. Sufficient ventilating air is required where diesel-powered equipment is operated to control the potential health hazards of diesel exhaust. Sampling every shift confirms the effectiveness of the mine ventilation system in addressing these hazards.

Part 7 Equipment Approval

MSHA regulations require the Agency's approval of the design of electrical equipment to be used in the production areas of underground coal mines. This equipment must be designed to eliminate fire and explosion hazards. MSHA's approval program has been very successful in reducing the number of fires, explosions and other hazards associated with electric-powered equipment. The final rule establishes a similar approach for diesel-powered equipment used in areas of underground coal mines where permissible (explosion-proof) electric equipment is required, ensuring the same level of safety in mines where diesel-powered equipment is used.

The permissibility requirements for diesel-powered equipment used in gassy non-coal mines in MSHA's part 36 regulations have been in place for a number of years. Although specific regulations did not exist for diesel-powered equipment operated in underground coal mines, MSHA has used the ventilation plan approval process to require the use of permissible diesel-powered equipment, approved under part 36, in those areas of underground coal mines where permissible electric equipment is required. However, mine ventilation plans have generally only addressed fire and explosion protection for equipment operating near the point of coal extraction (inby), and other locations where methane may be present, and have not addressed other possible safety hazards associated with the use of diesel-powered equipment in other (outby) areas. Additionally, mine ventilation plans have not dealt with such important concerns as the storage and handling of diesel fuel and regular maintenance of diesel equipment.

The final rule requires that only approved engines be used in diesel-powered equipment in underground coal mines, and establishes approval requirements for diesel engines to be used in both permissible areas (inby) and nonpermissible areas (outby) under part 7, subpart E. The subpart E approval requirements are modeled after existing approval requirements in part 36 for engines used in gassy non-coal mines. Certain other safety features, such as flame arresters, spark arresters, and water scrubbers, must be added to the engines used in permissible areas to ensure that they can be operated safely in the coal mine environment. An engine in combination with these safety features is termed a diesel power package. A separate approval was established in the final rule for the power package because the power package manufacturer is normally a company other than the engine manufacturer and controls the assembly of the power package. In addition, approval requirements for power packages under part 7, subpart F, are incorporated into machines approved under existing part 36. This is similar to the approach taken for electrical equipment where explosion-proof components are incorporated into machines approved under part 18.

In order to protect miners from harmful contaminants emitted from diesel engines, the approval requirements in the final rule contain test procedures and limits on the concentrations of carbon monoxide and oxides of nitrogen. Based on commenters' recommendations, the final rule requires that the same test cycle be used for testing both the gaseous and particulate emissions. In response to commenters' recommendations, the final rule is based on ISO 8178, an international consensus standard, which establishes a common test cycle for the measurement of gaseous and particulate emissions. All equipment testing under part 7 is intended to be conducted at test sites other than MSHA facilities, such as manufacturers' laboratories, independent testing laboratories, or other government or university laboratories.

Part 70 Exhaust Gas Monitoring.

The final rule addresses the monitoring and control of gaseous diesel exhaust emissions. The final rule requires area sampling as part of the onshift examination during every work shift. These monitoring provisions will ensure, in a reliable and systematic manner, that miners will be protected from exposure to harmful levels of gaseous contaminants.

The final rule requires that mine operators take representative samples of carbon monoxide and nitrogen dioxide in strategic locations to determine concentrations of these contaminants in miners' workplaces. The sampling locations are based on knowledge of the specific operation of diesel equipment underground and the behavior of gaseous emissions generated by these machines. Samples exceeding an action level of 50 percent of the threshold limit values (TLV®) for carbon monoxide and nitrogen dioxide trigger corrective action by the mine operator.

Part 75 Safety Requirements

The final rule specifies minimum ventilating air quantities in areas where diesel equipment is operated, and requires that the quantities be incorporated into the mine operator's approved mine ventilation plan. As part of the equipment approval process in part 7 of the final rule, diesel engines used underground are tested for gaseous and particulate emissions. The required minimum ventilating air quantity is determined based on the results of these emission tests and is included on the approval plate for each unit of diesel-powered equipment. The approval plate quantity of ventilating air is the air quantity needed to dilute the exhaust gases to their permissible exposure limits. This air quantity should be used in ventilation system design by the mine operator and in the evaluation and approval of minimum air quantities in ventilation plans by MSHA.

Under the final rule individual units of diesel equipment must be ventilated, as a general rule, with the air quantity specified on the equipment's approval name plate. The quantity of air required in areas where multiple units of equipment are operated is based on a simple addition of approval plate air quantities. The final rule also allows for adjustments in air quantities for multiple units of equipment, if sampling of contaminants indicates that lesser air quantities will result in dilution to the necessary levels. In addition, the final rule establishes specific locations where air quantities must be measured.

Under the final rule, low sulfur fuel must be used to operate diesel-powered equipment underground. Low sulfur fuel, which is readily available and widely used throughout the United States, will lower gaseous and particulate emissions, helping to protect miners from exposure to harmful diesel exhaust contaminants. In addition, the final rule prohibits the use of flammable liquids as additives in diesel fuel used underground and requires that only additives registered with the Environmental Protection Agency in accordance with 40 CFR Part 79 be used in diesel-powered equipment.

The use of diesel fuel underground can present risks to miners' safety, because the spilling of fuel on hot surfaces or electric components, or the inadvertent ignition of stored diesel fuel, can result in fire. Additionally, a fire started with a combustible material other than diesel fuel that then spreads to diesel fuel stored underground could be catastrophic. Diesel fuel handling and storage are addressed in the final rule by specific requirements for diesel fuel storage and the transportation of fuel from one location to another.

New design, installation, and maintenance requirements are established under the final rule for fire suppression systems installed on diesel-powered equipment and fuel transportation units. The requirements in the final rule address the risk of fire on diesel-powered equipment caused by, for example, hot exhaust components, dragging brakes, and shorted electrical components igniting diesel fuel, hydraulic fluid, brake fluid, lube oil, and other combustible materials. The final rule also requires that automatic fire-suppression systems be listed or approved by a nationally recognized independent testing laboratory.

The final rule recognizes that regular maintenance of diesel-powered equipment is essential. Inadequate equipment maintenance can result in the creation of a fire or explosion

hazard, and the levels of harmful gaseous and particulate components in diesel exhaust can rise when equipment is not adequately maintained. In response, the final rule requires diesel-powered equipment to be examined on the same weekly basis as electric equipment. The rule specifically requires that air filters be changed and scrubbers be flushed regularly, and that weekly gaseous emission tests be conducted on certain diesel equipment while the engine is operating. The final rule also requires that persons performing certain work on diesel-powered equipment be qualified. Commenters agreed that requiring diesel-powered equipment to be maintained in approved condition is necessary to ensure that features installed to reduce the risk of fire, explosion, and harmful emissions are operating properly. The final rule does not adopt the proposal that MSHA approve the training plans used for qualification. Under the final rule, training to establish qualification for persons performing maintenance may be obtained through the equipment manufacturer, community colleges, training schools, or other training providers.

Amendments to Existing Part 75 Requirements

The final rule amends certain existing MSHA regulations in part 75 by extending their applicability to diesel-powered equipment. The final rule requires that certain types of diesel-powered equipment be equipped with methane monitors to detect dangerous levels of methane, and also with cabs or canopies to protect miners from roof falls. Additionally, the final rule clarifies that accumulation of coal dust and other combustible materials is prohibited on diesel-powered equipment. These safety features have been proven to save miners' lives.

II. Discussion of the Final Rule

A. General Discussion

Recordkeeping Requirements in the Final Rule

Recordkeeping requirements in the final rule are found in §§ 7.83 and 7.97, Application requirements; §§ 7.90 and 7.105, Approval marking; §§ 7.108, Power package checklist; § 75.363, Hazardous condition; posting, correcting and recording; § 75.371 (r), (kk), (ll), (mm), (nn), (oo), and (pp), Mine ventilation plan, contents; § 75.1901(a), Diesel fuel requirements; § 75.1904(b)(4)(i), Underground diesel fuel tanks and safety cans; § 75.1911(i) and (j), Fire suppression systems for diesel-powered equipment and fuel transportation units; § 75.1912(h) and (i), Fire suppression systems for permanent underground diesel fuel storage facilities; § 75.1914 (f)(1), (f)(2), (g)(5), (h)(1) and (h)(2), Maintenance of diesel-powered equipment; § 75.1915(a), (b)(5), (c)(1), and (c)(2), Training and qualification of persons working on diesel-powered equipment.

The paperwork burden imposed on manufacturers by the final rule totals 558, which is an increase of 790 burden hours for the transfer of hours from part 36 approval requirements, and a decrease of 232 hours for the removal of parts 31 and 32. In the first year the final rule is in effect, the burden hours on mine operators will be 56,258, of which large and small mine operators will incur 54,774 and 1,484 hours, respectively. After the first year, the burden hours to mine operators will be 52,228, of which large and small mine operators will incur 50,949 and 1,279 hours, respectively.

In the first year that the final rule is in effect, the total new paperwork burden hours to mine operators and manufacturers will be 56,816 [56,258 + (790 − 232)]. After the first year, the total new paperwork burden hours to mine operators and manufacturers will be 52,786 [52,228 + (790 − 232)].

MSHA solicited comments regarding the burden estimates or any other aspect of the collection of information in the proposed rule. Proposed paperwork requirements were submitted to the Office of Management and Budget (OMB) for review in accordance with section 3504(h) of the Paperwork Reduction Act of 1980 (PRA 80). Comments by OMB were filed under comment numbers 1219–0111, 1219–0112, and 1219–0114. Control number 1219–0100 was approved for proposed paperwork burden hours required by part 7.

When proposed in 1989, the information collection requirements in the diesel equipment regulations were calculated under PRA 80. The final rule calculations are done in compliance with the Paperwork Reduction Act of 1995 (PRA 95). Generally, changes in the final rule burden hour and cost estimates from the proposed requirements result from the revision necessitated by PRA 95. When the change represents a regulatory change, it is so noted in the discussion of the appropriate section within the preamble. For details on the calculation of paperwork hours and costs see ''VII, Paperwork Reduction Act of 1995'' in the Regulatory Impact Analysis, which may be accessed electronically or may be requested from MSHA's Office of Standards, Regulations, and Variances.

Information is to be recorded, maintained for the period specified, and made accessible, upon request, to authorized representatives of the Secretary and to miners' representatives. Records are to be stored in a manner that is secure and not susceptible to alteration, to preserve the integrity of records for review by interested parties. This may be done traditionally, by recording in a book, or electronically by computer.

Examples of books that MSHA considers to be secure and not susceptible to alteration include, but are not limited to, record books that are currently approved by state mine safety agencies, and permanently bound books. Examples of books that would not be considered secure include loose-leaf binders and spiral notebooks.

Recognizing the trend of electronic storage and retrieval of information through computers to be an increasingly common business practice, MSHA permits the use of electronically stored records, provided that they are secure and not susceptible to alteration, that they are able to capture the information and signatures required, and that information is accessible to authorized representatives of the Secretary and miners' representatives. ''Secure'' is intended to mean unalterable or unable to be modified. An example of acceptable storage would be a ''write once, read many'' drive. Electronic records meeting these criteria are practical and as reliable as traditional records. Although the final rule does not require backing up the data, some means is necessary to ensure that the condition and existence of electronically stored information is not compromised or lost.

The 1995 Paperwork Reduction Act mandates agencies to encourage the use of electronic submission of responses to minimize the burden of the collection of information on respondents. Likewise, one of the major objectives of Executive Order No. 12866 is to make the regulatory process more accessible and open to the public as a means to reduce the duplication of information between agencies. Elsewhere in this preamble, MSHA announces the electronic availability of its rulemaking documents with access instructions. The mining community and other interested parties are encouraged to access on-line material as needed.

B. Section-by-Section Discussion

The following section-by-section portion of the preamble discusses each provision affected. The text of the final

rule is included at the end of the document.

General Discussion of Diesel Equipment Approvals and Safety Requirements

One of the three major areas addressed by the Diesel Advisory Committee was the approval of diesel-powered equipment. Historically, MSHA and its predecessor agencies have approved equipment intended for use in areas of mines where methane and other substances pose the danger of a fire or explosion. Through the approval process, equipment is evaluated against technical requirements which, when met, will render the equipment safe for its intended use in the mine environment. In part as a result of this process, the approved equipment used in mines in the United States is recognized as among the safest in the world.

The Advisory Committee recommended that diesel-powered equipment for use in underground mines be subject to MSHA approval in much the same way that electrical equipment has been regulated. Under existing standards, electrical equipment operated in the area of extraction and in return airways of underground coal mines and gassy metal and nonmetal mines, where methane may accumulate, must be approved as permissible (explosion-proof). Electrical equipment operated elsewhere in these mines is not required to be permissible, but is subject to certain safety requirements to protect against fire, shock, and other hazards of operation. The Advisory Committee further recommended:

- Only diesel-powered equipment currently considered permissible should be permitted to continue to operate in areas of coal mines where permissible electrical equipment is required.
- Separate specifications should be developed for diesel-powered equipment used in areas where permissible equipment is required and elsewhere.
- An approval program for diesel-powered equipment and portable, attended equipment should be established. This program should identify those equipment design features most readily addressed by the equipment manufacturers.
- A time schedule should be developed to allow for conversion of outby equipment presently in use through retrofits, replacement, or additional interim safety features to meet the applicable new requirements.
- Equipment newly introduced underground after a fixed date should meet the new standards.
- Current safety requirements including those that are applicable to electric equipment should apply to diesel equipment as appropriate.
- Only approved diesel engines should be used in underground equipment and the approval requirements should include measurements of exhaust gas pollutants and determination of a nameplate airflow quantity. Measurement of particulate generation should also be included in the engine approval process.

In the proposed rule, MSHA outlined three new subparts for existing part 7, which set approval requirements for diesel engines and power packages to be used in underground coal mines. The Agency also gave notice of its intention to develop approval requirements for fully assembled diesel-powered machines under a proposed subpart H for permissible equipment and subpart I for large outby equipment. Requirements for a limited class of light-duty equipment and stationary unattended equipment were proposed in part 75. A special class of equipment consisting of ambulances and fire fighting equipment was proposed that could be used in emergency situations as part of the mine's evacuation plan. The proposal also included provisions to permit fire prevention features in lieu of surface temperature controls for diesel locomotives.

Currently, MSHA approves diesel equipment under 30 CFR Part 36 for use in ''gassy noncoal mines''. In underground coal mines, ventilation plans specify the use of diesel-powered equipment approved as permissible under part 36 in areas where permissible electric equipment is required. In addition to the equipment approval under part 36, MSHA regulations address the approval of diesel mine locomotives in 30 CFR Part 31, and of mobile diesel-powered equipment for noncoal mines in 30 CFR Part 32. The proposal suggested that parts 31, 32, and 36 could be revised or revoked, and solicited comment. Some commenters favored retaining all of the existing diesel approval regulations since they still could have some application for equipment used in metal and nonmetal mines. Commenters generally agreed that the proposed rules for part 7 should supersede any applicability these existing approval regulations have for diesel engines used in underground coal mines.

The final rule for part 7 governs the approval of diesel engines intended for use in underground coal mines. As recommended by the Advisory Committee and as set forth in the proposed rule, the final rule requires that all diesel engines used in underground coal mines be approved.

Part 7 was originally promulgated in 1988 to establish application procedures and requirements for MSHA approval of certain products for use in underground mines, with testing conducted by the applicant or a third party. Traditionally, MSHA's role in approving products for safety emphasized testing by the Agency. Under part 7, testing is performed by the applicant or by a third party selected by the applicant, with MSHA maintaining the right to observe product testing. This approach has permitted MSHA to focus on its product audit function and keep pace with technological improvements in mining products.

As originally promulgated, part 7 applied to only two types of products: brattice cloth and ventilation tubing under subpart B, and battery assemblies under subpart C. Subsequently, three additional subparts were developed covering multiple-shot blasting units; electric motor assemblies; and electric cables, signaling cables, and cable splice kits. As designed, part 7 expedites the approval process, while providing greater assurance that the products are manufactured in accordance with safety specifications.

The final rule for part 7 is organized into two subparts—E and F. Subpart E sets diesel engine performance and exhaust emission requirements. As more fully discussed elsewhere in the preamble, subpart E creates two classes of engine approvals—one for Category A engines and one for Category B engines. Engines intended for use where permissible electric equipment is required in underground coal mines must have a Category A approval; engines for use elsewhere in underground coal mines must meet the requirements for Category B engines.

Subpart F of the final rule sets standards for safe design of diesel engines with respect to both fire and explosion hazards. The final rule establishes requirements for approval of diesel ''power packages'' on engines intended to be used where electric equipment is required to be permissible under existing standards. The term ''power packages'' refers to an approved engine and those components added to the engine, such as flame arresters, which prevent the ignition of methane, and surface temperature controls, which prevent the ignition of accumulations of combustible materials and combustible liquids. Permissible equipment is designed to be explosion-proof.

Subpart G of the proposed rule would have established requirements for diesel

power packages intended for use in areas of underground coal mines where permissible electrical equipment is not required. As this equipment is not designed to be operated in a potentially explosive methane environment, the proposed rule would not have required these power packages to have explosion-proof features. However, these diesel engines do present fire hazards which must be controlled. Under the proposal, subpart G would have set standards for surface temperatures, exhaust cooling, and safety system controls. As discussed more fully below, the final rule does not retain subpart G, but addresses these hazards through new requirements in part 75.

The proposed rule, responding to a recommendation of the Advisory Committee, also established a category of ''limited class of light-duty diesel-powered equipment.'' This category included machines with light-duty cycles, such as pickup trucks and personnel carriers. This equipment, while light-duty as compared to production equipment, can, nevertheless, present a fire hazard. For this ''limited class'' of diesel-powered equipment, instead of requiring surface temperature controls, the proposal set standards for fire prevention features that would prevent fuel, hydraulic fluid, and lubricants from coming into contact with hot engine surfaces. Features such as special fuel system protection, fire suppression systems, safe electrical systems, and engine compartment sensors that shut down the engine in the event of overheating were specified in the proposal for additional fire protection. Other necessary safety features, such as braking systems, were also addressed by the proposal. As recommended by the Advisory Committee, these requirements were not made part of the approval process described above, but were set forth in the proposal as safety standards for underground coal mines, appearing in 30 CFR Part 75.

The final rule retains many of the provisions of the ''limited class'' concept in the proposal, but broadens the scope of the equipment subject to these requirements to include all equipment not required to be permissible (outby equipment). This change eliminates the need for formal approval of outby equipment, and simplifies the final rule. This aspect of the final rule, and the diesel-powered equipment approval requirements, are discussed in detail under the section-by-section analysis which follows.

In the proposed rule MSHA notified the public of its intentions to develop two new approval regulations. Subpart H would have established requirements for the approval of fully assembled permissible diesel-powered equipment, and subpart I would have established approval requirements for fully assembled nonpermissible diesel-powered equipment. These sections would have included machine features currently required by part 36 for permissible equipment and similar features, described above, for ''limited class'' equipment. These subparts would have required the incorporation of appropriate power packages as described in proposed subparts F and G.

In the advance notice of proposed rulemaking, which accompanied the proposed rule, MSHA requested comments on this regulatory approach. Commenters objected to a formal approval program for nonpermissible equipment, but supported the incorporation of machine safety features in the use requirements specified in part 75. Commenters also supported the need for continuing the approval program for permissible equipment.

In response to these comments, the final rule retains part 36 as the basis for the approval program for permissible diesel-powered equipment and adopts the machine safety features specified for the limited class of light-duty equipment in the proposal for all nonpermissible equipment. Subparts H and I are not further developed. Instead, the final rule adopts the fire prevention features specified for limited class equipment for all nonpermissible equipment. Additionally, the final rule enhances the fire prevention features that now apply to all nonpermissible equipment. This approach eliminates the need for subpart G of the proposal dealing with power packages for outby equipment.

The final rule makes certain revisions to part 36 to update and make these existing requirements more flexible. The final rule revises part 36 to remove references to ''gassy noncoal mines and tunnels'', thus making these existing regulations applicable to equipment intended for use in coal as well as in metal and nonmetal mines. In addition, part 36 is amended to afford equipment manufacturers the option of incorporating in equipment submitted for approval either a part 7, subpart F power package, or engine and safety component systems that meet the existing requirements of part 36. Under the final rule, part 36-approved equipment with a part 7, subpart F power package will be suitable for use in underground coal mines where permissible electrical equipment is required. Part 36 equipment with engine and safety component systems certified under part 36 will continue to be recognized for use in metal and nonmetal mines where permissible equipment is required.

These changes are responsive to commenters who recommended that part 36 continue to be utilized for approving diesel-powered equipment. The final rule revisions to part 36 also retain, as recommended by commenters, a distinction between approval requirements for equipment used in coal mines and approval requirements for metal and nonmetal mining equipment.

The final rule revokes parts 31 and 32. MSHA previously identified these regulations for elimination in its response to the President's March 4, 1995, Regulatory Reform Initiative. Parts 31 and 32 are outdated and, with the final rule changes to parts 7 and 36, are obsolete. Only nine approvals have been issued under part 31 since its inception, and none have been issued since 1977. No other MSHA standards require part 31-approved equipment, and diesel mine locomotive manufacturers have submitted approval applications under part 36 for locomotives intended to be used where permissible equipment is required. With the revocation of part 31, diesel mine locomotive manufacturers may continue to acquire equipment approvals under part 36.

The part 32 approval requirements for mobile diesel-powered equipment used in noncoal mines are likewise unnecessary. No MSHA regulation requires the use of part 32 equipment, and no part 32 machine approval has been issued since 1981. Part 32 engine certifications have continued to be issued by MSHA, however, and some state and federal agencies' regulations make reference to part 32. State and federal agencies that reference part 32 are directed to look to part 7, subpart E, which contains engine requirements, and to §§ 75.1909 and 75.1910, which contain the requirements for other machine features. Together, these final standards cover the requirements previously found under part 32. These new sections of the final rule will continue to accommodate those government agencies that reference MSHA approval or certification regulations.

Likewise, manufacturers seeking part 32 engine approvals will be able to acquire the requisite engine approval through the new part 7, subpart E. Existing part 32 engine approvals continue to be valid.

A significant issue for the Advisory Committee and in the proposal was the schedule set for compliance with the new standards for diesel-powered equipment. The Advisory Committee

recommended that MSHA require diesel equipment newly introduced underground to meet the new standards after a certain date. The Committee further recommended that MSHA set a schedule for existing diesel equipment to meet any new requirements.

The proposal called for the part 7 approval requirements to be effective 60 days after publication of the final rule. The schedule for requiring in-mine use of diesel equipment meeting the new requirements was set by proposed § 75.1907. Under these provisions, the new requirements would have been met over a schedule ranging from six months to five years after the effective date of the final rule.

The final rule follows the approach of the proposal, setting effective dates for the new approval requirements, as well as the schedule for requiring in-mine use of diesel-powered equipment which meets the new requirements. In response to the comments and as a result of not adopting proposed subparts G, H, and I, the final rule sets a compliance schedule ranging from 60 days to three years after publication of the final rule. In order to facilitate implementation of the final rule, MSHA will begin accepting approval applications under revised parts 7 and 36 immediately. In addition, MSHA will continue power package testing until the Agency determines that a competitive capacity exists in the private sector. At that time, MSHA will discontinue power package testing and rely solely on the part 7 testing provisions.

Subpart E Overview

Subpart E of the final rule is new and amends existing part 7. As an amendment to these existing regulations, the general administrative provisions of subpart A of part 7 apply to the new subpart E application requirements.

Subpart E establishes engine performance and exhaust emission requirements for MSHA approval of diesel engines for use in underground coal mines. As discussed elsewhere in this preamble, diesel engines for use in metal and nonmetal mines are approved under part 36.

The final rule, like the proposal, creates two classes of engine approvals—Category A and B—for diesel engines to be used in underground coal mines. Several commenters objected to the proposed approval of diesel engines for use in outby areas, noting that outby electrical equipment is not subject to approval under existing standards. However, other commenters stated, and the Diesel Advisory Committee acknowledged, that all diesel engines in underground coal mines should meet certain safety and performance specifications. In its report the Advisory Committee suggested that, depending on equipment location and use, different requirements would be appropriate for diesel engines. One commenter to the proposal recommended that all diesel engines be approved as permissible.

For underground coal mines, MSHA believes that clean-burning engines are critically important. Unlike electrical equipment, diesel engines emit exhaust which contains toxic gases that can be harmful to miners. Inappropriately designed engines can pollute the mine atmosphere excessively, elevating toxic gases to levels that cannot be controlled with normal ventilation practices.

To achieve the objective of clean-burning, appropriately designed engines in mines, the final rule sets performance standards for all diesel engines, whether they are operated in the face area or outby.

The emission test requirements for Category A and B engines are the same, except that Category A engines are tested with methane injected into the intake system. Equipment operating at or near the point of coal extraction and in return air courses may encounter concentrations of methane gas, which is liberated during mining. Testing an engine with methane injected in its intake simulates operation of the engine in these areas of coal mines. Operation in methane atmospheres causes an increase in exhaust emissions, which requires higher ventilation rates.

Under the final rule, diesel equipment used in areas where permissible electrical equipment is required by existing standards incorporate fire and explosion prevention features provided by a power package. Such a power package must include a Category A engine and components added to the engine to prevent the ignition of methane and accumulations of combustibles. Power packages intended for use with Category A diesel engines must be approved under part 7, subpart F of the final rule.

Current safety standards require that intake air courses in areas away from or outby the mining face be maintained free of explosive concentrations of methane. Engines used on equipment operated in these outby areas must have a Category B approval under the final rule. Engines approved under Category B are emission tested without the injection of methane into the engine's intake system.

The proposed technical requirements for diesel engines addressed the control of gaseous exhaust emissions and quantification of the engines' particulate matter generation. The proposed rule also set specifications for the equipment used and the standard laboratory test conditions for determining gaseous and particulate output for diesel engines. The proposed requirements for measuring gaseous emissions were derived from now-removed part 32 and existing part 36, and the proposed requirements for measuring diesel particulate were based on the Environmental Protection Agency's requirements published in 40 CFR Part 86. In addition, the proposal specified the engine operating parameters as well as a method to calculate the ventilation rate and particulate index for the engine.

Engine manufacturers do not manufacture engines specifically for mining. Typically, ''off-road'', heavy-duty diesel engines are utilized in mining equipment. Over-the-road utility vehicles and smaller general industry equipment are also used in mines. At the time of the proposed rule, the only certification test specifications designed for engines used in mining were the MSHA engine certification standards in now-removed part 32 and in existing part 36.

In the proposal, MSHA used its rules in now-removed part 32 and existing part 36 for the steady-state test for gaseous diesel exhaust emission. The test equipment specified in the proposal for diesel exhaust particulate measurement was modeled after the transient test equipment required in 40 CFR Part 86, subpart N.

Commenters to the proposal stated that a correlation should not be made between MSHA's proposed rule and then-current EPA testing, because the proposal used a test with specific points in a ''steady state'', while EPA used a ''transient test.'' Commenters also recommended using the same test cycle for both gaseous and particulate matter. In addition, commenters generally recommended comparability of testing for similar types of tests and indicated a desire to use international standards whenever possible.

The International Organization for Standardization (ISO) has prepared ''ISO 8178 Reciprocating Internal Combustion Engines—Exhaust Emission Measurement'', which includes test specifications for off-road diesel engines. The ISO is a recognized international standard-setting body. Equipment manufacturers, as well as other standard-setting bodies, make reference to and adopt the standards developed by the ISO.

ISO 8178 is an international test standard for measuring off-road diesel engine emissions. It contains a detailed description of the test equipment requirements and standard procedures for conducting a steady-state test to determine both gaseous and particulate emissions. The ISO 8178 procedures also specify an 8-point test cycle for measuring both gaseous and particulate emissions. ISO 8178 does not set emission limits.

The final rule is based on the ISO 8178 ''Reciprocating Combustion Engines—Exhaust Emission Measurement'', part 1 test procedures that apply to gaseous and particulate emission testing for diesel engines. This change from the proposal is responsive to commenters' concerns about correlating the proposed rule and EPA diesel engine tests, and simplifies the test procedures. For example, under the final rule the gaseous emission tests are reduced to 8 test points from 39 test points under the proposal. The particulate emission tests are also reduced from 10 to 8 test points. In addition, the final rule permits the tests for exhaust gaseous and particulate emission tests to be performed concurrently following the same test cycle, rather than independently following different cycles. A number of minor changes are made in §§ 7.86, 7.87, 7.88, and 7.89 of the final rule, so that the tests performed under these sections conform to the ISO 8178 requirements. Substantive changes to these sections are discussed in this overview and in the section-by-section discussion that follows.

The final rule adds one requirement to the ISO 8178 test procedures. Section 7.89(a)(5)(iii) requires that 1.0 percent of methane be added to the intake air for testing Category A engines. This addition to the ISO 8178 procedure should present no technical difficulties for manufacturers or third-party laboratories. MSHA, however, will provide technical assistance for setting up this aspect of the test procedure upon request. The final rule also requires a test to determine the maximum fuel-to-air ratio, and specifies requirements for determining the gaseous ventilation rate and particulate index for diesel engines.

Basing the final rule on an international consensus standard enables diesel engine manufacturers to test with a single set of procedures common to both the United States and foreign markets. Also, existing test facilities established to perform tests to these international standards can be used to perform the tests prescribed by this final rule. In addition, use of the ISO 8178 test procedures leads to better comparability with international testing practices, and provides a more competitive posture for American products in foreign markets. Many off-road engine manufacturers are already complying with EPA and California Air Resources Board (CARB) requirements, which include testing in accordance with ISO 8178 procedures.

One commenter to the proposal objected to permitting engine manufacturers or third-party laboratories to test diesel engines for conformance to approval standards, questioning the objectivity of such an approach. MSHA experience over eight years with manufacturers and third-party laboratory testing under existing part 7 and the Agency's program for off-site testing (POST) of diesel engines confirms that non-MSHA testing is performed competently and produces reliable results. In addition, MSHA will initially witness all tests conducted by manufacturers and third parties to ensure continued reliability of test results. In all cases, MSHA will accept only results of tests performed by manufacturers or third-party laboratories which have the capability to competently perform the required tests with properly calibrated instrumentation.

Section 7.81 Purpose and effective date. The part 7, subpart E approval requirements are effective November 25, 1996. MSHA will begin accepting applications under subpart E immediately, but will complete any in-house part 32 applications, or evaluate such applications under the new part 7, subpart E, at the applicant's choice. As discussed elsewhere in this preamble, the requirements for the use of approved diesel engines in underground coal mines are effective in 3 years.

Commenters to the proposal generally supported the approval requirements of subpart E for diesel-powered equipment to be used in underground coal mines. Several commenters suggested, however, that a phase-in period, up to three years, be established. According to these commenters, manufacturers would use the phase-in period to gain experience with the new test procedures, become familiar with new engine approval application procedures, and re-evaluate their existing approvals.

The final rule does not incorporate a phase-in period for diesel engine approvals. Diesel engine manufacturers and third-party testing facilities are familiar with the ISO 8178 test procedures on which the final rule is based, and have the capability to perform these tests in their laboratories with minor changes. In fact, two engine manufacturers and a testing laboratory have tested diesel engines for MSHA approval using the ISO 8178 procedure.

With this diesel engine testing experience and capability already present in the marketplace, MSHA finds no reason to provide an extended phase-in period for the approval standards for diesel-powered equipment, and anticipates that manufacturers and third-party testing laboratories can immediately begin testing engines under subpart E.

Section 7.82 Definitions. In addition to the existing definitions in § 7.2, § 7.82 of the final rule sets out and clarifies the key terms which apply in subpart E. Commenters generally agreed with the proposed definitions, which were derived from definitions developed for ISO 8178 and the Society of Automotive Engineers (SAE) Recommended Practice J177.

No comments were received on the proposed definitions for ''Category A engines'', ''Category B engines'', ''corrosion-resistant material'', ''diesel engine'', ''exhaust emission'', ''percent load'', and ''steady-state condition''. These terms and their proposed definitions are adopted in the final rule.

The definitions of the terms ''rated speed'' and ''intermediate speed'' in the proposed rule have been modified in the final rule in response to a commenter who recommended that MSHA's definitions of these terms conform to definitions contained in internationally accepted standards. The definitions of these terms in the final rule are conformed to the definitions in ISO 8178.

The term ''peak torque speed'' in the proposed rule has been changed to ''maximum torque speed'' in the final rule to conform with ISO 8178. Both terms convey the same meaning.

One commenter objected to the definition of ''diesel particulate matter'' as ''any material, with the exception of water, which is collected on a filter passed by an air diluted exhaust stream.'' According to this commenter the proposed definition was vague and too dependent on the filter used and method of sampling. The final rule does not include the proposed definition, adopting instead the definition for diesel particulates contained in ISO 8178. The ISO definition is more specific, providing that diesel particulates are ''any material collected on a specified filter media after diluting diesel exhaust gases with clean filtered air at a temperature less than or equal to 325 K (52° C) as measured at a point immediately upstream of the primary filter. This is primarily carbon, condensed hydrocarbons, and sulphates

and associated water.'' In addition, the filter and sampling methods, which are well detailed in ISO 8178, are included in the final rule. The objective of this definition is to facilitate accurate, repeatable tests for the diesel particulate matter in an engine's exhaust. Other definitions may be more appropriate for addressing health effects.

The same commenter also objected to the proposed definition of ''total oxides of nitrogen'' as focusing only on nitric oxide and nitrogen dioxide. The commenter suggested revisions to these definitions and offered definitions for several other terms used in the proposed rule, including ''gaseous ventilation'', ''particulate index'', ''threshold limit value'', ''permissible exposure limit'' and ''recommended exposure limit.'' According to the commenter, these terms were not used consistently in the proposal. The final rule does not adopt these suggested changes. Many of these terms have accepted meanings that are well known. However, changes throughout the final rule have been made to be sure the terms are used consistently and appropriately.

The proposed definition of rated horsepower is revised in the final rule to conform with current procedures for evaluating engines under existing part 36. This change will help define an engine's power output as it is related to performance testing. A definition for the term ''operational range'' is added to also conform with current procedures for evaluating engines under existing part 36.

Section 7.83 Application requirements. The proposed application requirements were derived from now-removed part 32 and existing part 36 and are largely unchanged in the final rule. The application procedures are designed to provide sufficient information to demonstrate compliance with the technical requirements of subpart E, and form the basis for approval of diesel engines.

The final rule adopts the proposal to permit applicants to submit composite drawings in lieu of individual drawings. This approach reduces paperwork and affords applicants flexibility in the preparation of their drawings.

The final rule also provides for certain information to be submitted after approval testing. This information includes the ventilation rate and particulate index for the engine, and the fuel deration chart, which provides guidance for how to adjust approved engines to compensate for altitude.

Like existing part 7 and other MSHA approval standards, the documentation formulated in the application process forms the basis for MSHA's approval. Approved diesel engines must be manufactured in accordance with the specifications contained in the approval and, once put into service, approved engines must be maintained and operated within the parameters set in the MSHA approval.

In general, commenters concurred with the proposed application requirements. One commenter suggested that a description of the design features which promote efficiency and control over production of toxic emissions specifically include fuel injection timing. MSHA agrees that specifications for the fuel injection system of diesel engines and the fuel injection timing are key in controlling exhaust emissions. The proposal included a requirement that the fuel injection system be detailed in approval applications. However, a requirement specifying the fuel injection timing was not included in the proposed rule.

The final rule adopts the proposed requirement for a description of the fuel injection system, and adopts in paragraph (b)(6) the suggestion that fuel injection timing also be specified. This information had been required in now-removed part 32 and is required for part 36 engine approvals and to help ensure accurate measurement of the engine's emissions during the tests and proper maintenance of the engine's fuel injection timing.

Although the Agency allows electronic record storage in other areas of this regulation, electronic computer submission of part 7 approval applications is not yet available. MSHA's Approval and Certification Center is developing a means for computer submission, and at present has pilot programs to facilitate the use of electronic reporting. However, the system is in the formative stage and is not yet available for public use.

The paperwork hours in the approval application, including test requirements, are assigned OMB control number 1219–0100.

Section 7.84 Technical requirements. This section of the final rule sets the specific technical requirements for Category A and Category B diesel engines. The objective of this aspect of the final rule is to set standards which, when met, will produce clean-burning diesel engines that are safe and appropriate for use in the confined environment of underground coal mines.

Like the proposal, the final rule's requirements for the gaseous emissions of diesel engines are based on appropriate sections of existing part 36 approval regulations for diesel engines. Experience confirms that compliance with these regulations, which address fuel injection adjustments and fuel-to-air ratios, produces engines that operate without excessive gaseous emissions that can be harmful to miners.

One commenter to the proposal suggested that the fuel injection system on approved diesel engines be required to be fixed and sealed so that it could not be changed. According to the commenter, sealing the system would prevent unauthorized changes.

The final rule does not adopt this suggested change, as adjustments to diesel engine fuel injection systems are necessary for maintenance and to compensate for altitude. Adjustments such as these permit the fuel-to-air ratio for diesel engines to be maintained at a level which minimizes exhaust emissions.

The final rule does, however, adopt the proposed security requirements to prevent unauthorized fuel injection system adjustments. Fuel injection system adjustments are required to be changeable only after breaking a seal, or by altering the injection system's design. For example, a shim may be added or removed to change the fuel pump's performance. These parts are supplied by engine manufacturers and must be used in accordance with the engine's approval. For engines with electronic fuel injectors, specialized computer interface equipment is used to adjust the computer programming sequence. The programming sequence must be installed by the engine manufacturer and is listed with the engine approval documentation. After adjustments are made in a fuel injection system, any seal removed must be replaced. Failure to follow these procedures for adjusting a fuel injection system would result in the engine no longer being in approved condition. Under § 75.1914(a) of the final rule, diesel engines used in underground coal mines are required to be maintained in approved condition.

Consistent with a recommendation of the Diesel Advisory Committee, the technical requirements for diesel engines also include undiluted exhaust limits for carbon monoxide and oxides of nitrogen, both of which have toxic properties which can be harmful to miners. The limits set for these gases, which are determined when the engine is operated at its maximum fuel-to-air ratio, are derived from existing § 36.26(b) and now-removed § 32.4(f). As noted in the proposal, applying these exhaust gas limits to diesel engines for use in outby areas is new.

One commenter questioned why the proposal set the same undiluted exhaust gas limits for Category A and B engines, except that the carbon monoxide limit

was 0.30 percent for Category A engines, while the carbon monoxide limit for Category B engines was set at 0.25 percent. This aspect of the proposal, which is adopted without change in the final rule, recognizes a difference in the test procedure between Category A and B engines. As noted above, Category A engines must be designed to operate safely in face areas and return air courses where methane may be present. Thus, Category A engine testing is performed with 1.0 percent methane injected into the intake air. The methane acts as additional fuel in the engine, which affects the fuel-to-air ratio. This change in fuel-to-air ratio increases emission levels, especially carbon monoxide and oxides of nitrogen. Thus, the final rule technical requirements permit a slightly elevated carbon monoxide level for Category A engines during testing so as to avoid imposing an unnecessarily strict test requirement for this class of diesel engines. The ventilating air requirement, however, is based on the actual emissions measured during testing.

The final rule also defines procedures to establish the ventilating air quantities necessary to maintain the gaseous emissions of diesel engines within existing required ambient limits. Emissions from both Category A and Category B engines are diluted to the same ambient levels when their ventilating air requirements are calculated. Like the proposal and consistent with the recommendations of the Diesel Advisory Committee, the final rule addresses this issue by requiring that a ventilation rate be set for each engine model. Under the final rule, this ventilation rate must appear on the engine's approval plate. The ventilation rate, calculated under § 7.88 of the final rule, indicates the amount of air necessary to dilute carbon dioxide, carbon monoxide, nitric oxide, and nitrogen dioxide to within allowable levels. For consistency, the levels specified in the final rule are those set by existing § 75.322. These exposure standards are based on the 1972 threshold limit values set by the American Conference of Governmental Industrial Hygienists (ACGIH) and have applied to underground coal mines for nearly 25 years. This aspect of the final rule comports with the recommendation of the Diesel Advisory Committee that gaseous diesel exhaust components not be treated differently from contaminants generated by other mining sources. The final rule does not adopt updated exposure standards at this time because this issue remains in the rulemaking process for Air Quality standards.

The exposure levels adopted by the final rule for purposes of calculating the ventilation rate for an engine will lead to lower required air quantities for ventilating subpart E-approved engines, as compared to engines approved under now-superseded part 36. This is because engines previously approved under part 36 were required to dilute oxides of nitrogen and carbon dioxide to levels lower than currently specified by the threshold limit values (TLV®'s) in § 75.322. The ventilation rates set for engines under the final rule will be more precisely related to current exposure standards. In addition, § 75.325(g) of the final rule revises the percentage of the approval plate air quantity that is required when multiple units of diesel equipment operate in the same air current. Finally, as discussed elsewhere, the final rule is designed to produce an integrated system of controls to protect miners from overexposure to harmful diesel emissions.

Commenters generally accepted the value and purpose of setting a ventilation rate for each diesel engine model. Knowledge of the ventilation rate needed to control gaseous emissions to safe levels will allow comparison of the efficiency and ventilation demands of different engine models, and facilitate evaluation of their general ventilation needs during use. One commenter, however, urged that the gaseous ventilation rate for control of diesel engine exhaust gases not be part of the approval process. According to this commenter, existing ventilation and air quality standards are adequate.

The final rule adopts the requirements for determining the ventilation rate necessary to dilute diesel engine exhaust contaminants. Ventilation systems provide different quantities of air at different locations in the mine. Knowing the ventilating air quantities needed for diesel-powered equipment will allow the mine operator to make informed decisions about equipment selection and utilization and mine ventilation.

Other commenters, who acknowledged the purpose of establishing ventilation rates for approved diesel engines, recommended for the sake of clarity that the levels set for the gases be specified in the final rule. In the proposal, MSHA had set these levels by reference to the time weighted average (TWA) concentrations for the gases. The final rule adopts this suggestion and the levels for carbon dioxide, carbon monoxide, nitric oxide and nitrogen dioxide are specified in the final rule. The levels in the final rule are identical to the levels in existing § 75.322, and MSHA intends that the levels in the final rule conform with any levels that may ultimately be updated. Specifically, if any of the levels for any of these contaminants are revised as part of MSHA's Air Quality rulemaking, MSHA intends to conform the levels in this section to any revised levels.

The proposed requirement for fuel deration received no comments. The purpose of this requirement, which is adopted without change from the proposal, is to ensure that the fuel-to-air ratio does not increase due to the lower density of air at higher altitudes. Not correcting the maximum fuel delivery on the engine for higher altitude operation results in increased emission levels. The fuel injection rate established during the approval may be required to be reduced when the engine is used at a higher altitude.

Implementing a recommendation of the Diesel Advisory Committee, the proposed rule also called for a particulate index to be set for approved diesel engines. The particulate index specifies the quantity of air needed to dilute the particulate generated by the engine to 1 milligram of diesel particulate matter per cubic meter of air. The control of particulate matter in diesel engine exhaust was a significant issue for the Advisory Committee. The Committee concluded that whole diesel exhaust represents a probable risk for causing human lung cancer, and recommended that MSHA develop a regulatory scheme to monitor and control diesel particulate underground. The Committee did not recommend an exposure level, but did urge that consideration be given to what level of exposure to diesel particulate presents a health risk to miners. MSHA is currently developing regulations, separate from this rule, to address this issue.

The Diesel Advisory Committee also recommended that a particulate index be set for engines so that the mining industry and MSHA could compare the particulate levels generated by different engines in terms of a ventilating air quantity. For example, if the particulate indices for diesel engines of the same horsepower were established as 7,500 cubic feet of air per minute (cfm) and 12,000 cfm respectively, an equipment manufacturer, mine operator, and MSHA personnel could use this information, along with consideration of the type of machine the engines would power and the area of the mine in which it would be used, to make certain decisions. For example, a mine operator could use this information when choosing an engine to roughly estimate an engine's contribution of diesel particulate to the mine's total respirable

dust. MSHA would use this information when evaluating mine dust control plans. Equipment manufacturers can use the particulate index to design and install exhaust after-treatments.

The final rule retains the proposed requirement for a particulate index to be set for approved diesel engines. Unlike the ventilation rate set for each engine, the particulate index value will not appear on the engine's approval plate. The particulate index, calculated under § 7.89 of the final rule, indicates what air quantity is necessary to dilute the diesel particulate in the engine exhaust to 1 milligram of diesel particulate matter per cubic meter of air. This information will be available to the mining industry from the engine manufacturer and MSHA.

Some commenters to the proposal objected to the use of a particulate index to establish required ventilation air quantities for diesel engines. These commenters noted that a diesel particulate permissible exposure level has not yet been set and maintained that suitable monitoring technology is not available for widespread field use. These commenters also urged that control of diesel particulate in underground mines be accomplished through a combination of measures, including fuel requirements, equipment design, and controls such as ventilation and equipment maintenance. The commenters recommended that the particulate index not be part of the engine ventilation rate, and concluded that such an index should be viewed as a guideline providing useful information about diesel engines. The commenters further suggested that additional evaluation be undertaken to determine appropriate procedures for setting a particulate index.

The overall approach of the final rule is to control diesel emissions in the underground mine environment through various established methods, including those suggested by commenters. The information provided by the particulate index is part of the multi-level approach recommended by the Diesel Advisory Committee.

As explained above, the particulate index value determined for a diesel engine is intended to provide useful information about diesel engines, as the commenters suggested. In addition, the particulate index value does not appear on the equipment's approval plate and therefore is not considered in setting the engine's required ventilation rate.

Section 7.85 Critical characteristics. Critical characteristics, which are specified for all part 7-approved products, are those features or specifications which, because of their importance to proper operation of the equipment, must be inspected or tested on each unit manufactured. The proposal called for inspecting or testing each diesel engine to verify that the fuel rate is set to altitude, and the fuel injection pump adjustment is sealed, if applicable. No comments were received on this aspect of the proposal, and the final rule adopts the proposal without substantive change. Instead of requiring the fuel rate to be set to altitude, the final rule specifies that the fuel rate be properly set.

As discussed elsewhere in this preamble, the rate of fuel delivery to a diesel engine significantly affects its gaseous and particulate emission. As noted earlier, correct adjustment of the fuel injection pump is essential to the efficient operation of diesel engines.

Inspecting or testing the proposed critical characteristics for diesel engines approved under part 7, subpart E reasonably ensures that the performance and emission characteristics of production engines will be equivalent to those of the engine tested for approval. As a result, miners are protected against harmful exposure to diesel emissions.

No comments were received on this aspect of the proposal, which is adopted by the final rule, with the change noted above.

Section 7.86 Test equipment and specifications. This section adopts the measurement and evaluation methods for emissions from diesel engines as described in ISO 8178–1. The final rule describes the apparatus, or test cell, required for testing diesel engine performance, and sets the specifications for operating this testing equipment to perform steady-state tests for both gaseous and particulate emissions.

The major components of a test cell are a dynamometer with engine operating controls, and gaseous and particulate emission measurement systems. This test cell is used to perform the test required by §§ 7.87, 7.88, and 7.89 of the final rule. Most engine testing laboratories today have the equipment and meet the specifications called for by ISO 8178–1 and the final rule.

The final rule's test cell requirements are substantially the same as the proposed requirements, except that the specifications for the testing apparatus and test conditions are revised to conform with ISO 8178–1. Commenters to the proposal did not direct attention to these requirements, but did express concern about correlating the proposed rule test requirements and Environmental Protection Agency diesel engine tests, and recommended that the MSHA procedures conform to internationally accepted test procedures. The adoption of the ISO 8178–1 provisions eliminates this issue and is responsive to commenters' concerns.

Like the proposal, the final rule also sets specifications for the fuel to be used during testing of diesel engines. The proposed rule would have required No. 2D diesel fuel with certain properties. A uniform test fuel is important to obtaining repeatable test results and test data that can be compared. Commenters did not direct their attention to this aspect of the proposal, except that they generally encouraged adoption of international standards to the extent possible.

The final rule revises the proposed requirements for diesel engine test fuel to conform with the fuel requirements in § 75.1901. Section 75.1901 of the final rule specifies the use of diesel fuel containing no more than 0.05 percent sulfur. Under this section, diesel fuel used for engine testing must also be low in sulfur content. In addition, the properties specified for test fuel conform with the test fuel EPA requires for testing diesel engines that use low sulfur fuel. Thus, the final rule will not require testing laboratories to acquire special fuel to comply with the final rule.

The final rule also adopts the proposal that Category A engines, which are intended for operation in areas of mines where concentrations of methane gas could be encountered, be tested with 1.0 percent of methane added to the engine's intake air. As noted above, this addition to the ISO 8178 test procedure adopted by the final rule should present no technical difficulties for manufacturers or third-party laboratories. MSHA, however, will provide technical assistance for setting up this aspect of the test procedure upon request.

Metering in 1.0 percent of methane to the intake air of Category A engines replicates a foreseeable operating condition in underground mines. In addition, methane gas acts as a fuel when it is aspirated into a diesel engine, increasing its output of carbon monoxide and oxides of nitrogen. These emission effects need to be accounted for in determining the gaseous ventilation rate for Category A engines.

Section 7.87 Test to determine the maximum fuel-to-air ratio. As noted earlier, the tests prescribed by this section are performed using the test cell meeting the requirements of § 7.86. Determining the maximum fuel-to-air ratio for diesel engines is essential to controlling harmful diesel engine emissions. Too rich a fuel and air

mixture produces engine exhaust with elevated levels of carbon monoxide and oxides of nitrogen.

Under this section, engines are required to be operated at several speed/torque conditions to determine the concentrations of carbon monoxide and the oxides of nitrogen. Acceptable performance is achieved when the levels of these exhaust gases do not exceed the limits set by § 7.84(b) of the final rule throughout the operational range of the engine.

Commenters did not address the proposed test to determine the maximum fuel-to-air ratio for diesel engines. The final rule adopts the proposal without change.

Section 7.88 Test to determine the gaseous ventilation rate. The test to determine the gaseous ventilation rate for a diesel engine is required by the final rule to be performed using the test cell required by § 7.86. This test may be performed together with the test to determine the particulate index required by § 7.89.

The test required by this section measures the undiluted exhaust gas concentrations of carbon monoxide, carbon dioxide, nitric oxide, and nitrogen dioxide in the exhaust. These constituent gases of diesel engine exhaust are potentially harmful to miners in the confined environment of underground mines.

In accordance with § 7.86, exhaust gas measurements must be made at 8 specified points while the engine is operated at each rated speed and horsepower requested by the approval applicant. For Category A engines, 1.0 percent methane is added to the engine's intake, as discussed above.

Like the proposal, the final rule specifies the calculations to be performed using the results obtained from the test procedure. These calculations produce a gaseous ventilation rate for the diesel engine. As discussed above, the ventilation rate indicates the amount of ventilating air necessary to dilute carbon monoxide, carbon dioxide, nitric oxide and nitrogen dioxide to within permitted levels. The ventilation rate for each approved Category A or B diesel engine will appear on the engine's approval plate. Knowledge of the ventilation rate needed to control gaseous emissions to safe levels will allow comparison of the efficiency and ventilation demands of different engine models, and their general ventilation needs during use can be evaluated.

As discussed above, commenters generally accepted the value and purpose of setting a ventilation rate for each diesel engine model. One commenter urged that the ventilation rate not be part of the approval process, while others supported the approach taken in the proposed and final rules. These commenters, however, suggested that the levels for the exhaust gases be stated in the final rule. The final rule adopts this suggestion in § 7.84(c).

Section 7.89 Test to determine the particulate index. Like the other engine tests prescribed by the final rule, the test to determine the particulate index for an engine is required by the final rule to be performed using the test cell required by § 7.86. As noted above, this test may be performed concurrently with the test to determine an engine's gaseous ventilation rate required by § 7.88.

The test required by this section measures the amount of particulate in the engine's exhaust when it is operated at eight specified operating conditions. For Category A engines, 1.0 percent methane is added to the engine's intake, as discussed above.

The proposed rule would have required that the particulate index be determined using a different set of test points than those used to determine the gaseous ventilation rate. The particulate index tests were based on a cycle of 10 test points. In response to commenters' suggestions that the particulate and gaseous emissions tests be conducted using the same test cycle and internationally accepted test procedures, the final rule adopts the same ISO 8178–4, 8-point test cycle for both the particulate and gaseous emissions tests.

The Diesel Advisory Committee observed that whole diesel exhaust represents a probable risk for causing human lung cancer. While proposing no specific exposure level, the Diesel Advisory Committee recommended control of diesel particulate in engines used underground through a combination of measures, including equipment design.

Like the proposal, the final rule does not set a particulate limit for engines. Instead, the final rule specifies the calculations to be performed using the results obtained from the test procedures in this section. From the calculations, a particulate index is derived. As discussed above, the particulate index for an engine does not appear on its MSHA approval plate. This information will be available, however, from MSHA and the engine manufacturer.

Section 7.90 Approval markings. This section requires that each approved diesel engine be identified with a permanent approval plate containing certain information. Approval markings to identify equipment appropriate for use in mining have been used for more than 85 years, and are routinely relied upon by users of mining equipment as well as state and federal inspection authorities.

The information required to be displayed on diesel engine approval plates includes the MSHA-assigned approval number, together with the engine's model number, ventilation rate, rated power, high idle setting, and the altitude above which the engine must be derated. Including these specifications on diesel engine approval plates gives engine users convenient, immediate access to information important to proper maintenance and operation of diesel engines.

Commenters directed little attention to this aspect of the proposal, which is adopted without change in the final rule. Commenters who objected to setting a ventilation rate for diesel engines as part of the approval process repeated this concern with respect to the requirement for the ventilation rate to appear on engine approval plates. As discussed above, setting a gaseous ventilation rate for diesel engines comports with the recommendations of the Diesel Advisory Committee and provides diesel equipment users with information important to protecting miners. Knowledge of the rate of ventilation needed to control the gaseous exhaust emissions of a diesel engine facilitates comparison of the efficiency and ventilation demands of different engine models.

The other information required by the final rule to appear on an engine's approval plate likewise provides engine users needed data. The high idle setting informs maintenance personnel of the engine speed appropriate for conducting several of the tests to be performed as part of the engine's permissibility checklist. Together, an engine's approval number, model number, and its rated power and speed facilitate use of the manufacturer's maintenance procedures. The maintenance procedures, along with the altitude above which the engine must be derated, specify the adjustments which must be made to ensure that an engine continues to operate in approved condition.

Burden hours required to make and mount MSHA approval plates are assigned OMB control number 1219–0100.

Section 7.91 Post-approval product audit. This section incorporates the standard audit requirement for part 7-approved equipment, specifying that approval holders must make a diesel engine available for audit by MSHA, at no cost to the Agency. The obligation to

supply an engine for audit under this section arises only upon request by MSHA, and is limited to no more frequently than once a year, except for cause. Under existing § 7.8(b), the approval holder may observe any tests conducted under the audit.

Post-approval audits are a critical part of MSHA's quality control program for approved equipment. By inspecting and testing an engine for continuing compliance with its approval specifications, potential problems can be detected and confidence in the approval process is maintained. Since the inception of post-approval product audits under part 7, MSHA has detected numerous discrepancies, which have been effectively corrected.

Commenters directed no attention to this aspect of the proposal, which is adopted without change from the proposal.

Section 7.92 New technology. This section is designed to facilitate the introduction of new technology or new applications of existing technology. It allows MSHA to approve a diesel engine that incorporates technology for which the requirements of subpart E are not applicable, provided that MSHA determines the engine is as safe as one which meets the requirements of subpart E. To make this determination, MSHA develops appropriate technical requirements and test procedures when novel designs are submitted for approval. Experience with this provision under existing regulations has shown that new innovations can be effectively evaluated and made available for use in a prompt fashion, thus serving the best interests of miners' safety and health.

Commenters supported this aspect of the proposal, stressing that research and technological improvements in diesel engines can be expected. The final rule adopts the proposal without change.

Subpart F Overview

Subpart F of the final rule amends existing part 7, which specifies testing by the approval applicant or a third party. As an amendment to the existing regulations, the general administrative provisions of subpart A of part 7 apply to these new subpart F application requirements.

Subpart F establishes design and performance requirements for MSHA approval of ''diesel power packages'' for use in areas of underground coal mines where permissible electrical equipment is required by existing safety standards. A ''diesel power package'' is a diesel engine, together with the attached safety components, such as flame arresters, spark arresters, surface temperature controls, shut down systems, and the exhaust cooling system that make a diesel engine explosion-proof and reduce the engine's surface temperature to a safe level. Like the proposal, the final rule requirements for diesel power packages are largely derived from existing MSHA approval regulations in part 36, which apply to diesel engines for use in gassy underground mines. The final rule is also consistent with current MSHA practices for coal mines using diesel-powered equipment and with the recommendations of the Diesel Advisory Committee. The Advisory Committee specifically recommended an approval program for diesel power packages.

Commenters generally accepted the proposal for MSHA approval of diesel power packages, recognizing the need for diesel-powered equipment used in underground coal mines to meet critical specifications and to be properly tested for safe operation in a potentially explosive atmosphere. Some commenters directed their attention to the effective date of subpart F, expressing concern about the availability of commercial testing facilities. For the reasons discussed below, the final rule does not adopt an extended phase-in period. However, accommodations are made in the final rule to simplify the implementation of testing in the private sector, and MSHA will continue to perform diesel power package testing to subpart F specifications for up to 3 years, pending the development of private sector resources.

Other commenters recommended that diesel engine exhaust after-treatment devices, such as particulate filters or catalytic converters, be required as part of diesel power packages. These commenters also suggested that the ventilation rate and particulate index set under §§ 7.88 and 7.89 of the final rule credit the use of such devices.

The final rule responds to these comments in part. Under the MSHA approval program in subpart E, MSHA will evaluate exhaust gas and particulate controls, provided these devices are integral to the engine design and are part of normal production engines. The effectiveness of such controls will also be considered in setting the engine's ventilation rate and particulate index. This approach will ensure that the controls are compatible with the engine and are effective. MSHA has already approved, under existing regulations, engines which incorporate techniques such as electronic fuel injection systems. Exhaust after-treatment devices that are not part of an engine's design and production have been developed which can reduce the particulate matter in diesel engine exhaust. Also, catalytic converters are available which can be added to engines to reduce the levels of some harmful gaseous emissions. MSHA encourages the use of these devices, and under existing regulations has approved, as safe, several power packages that utilize catalytic converters and particulate filters. However, under the final rule MSHA will not evaluate the effectiveness of these exhaust after-treatment devices. Exhaust after-treatment devices encompass a wide range of concepts that have demonstrated varying degrees of effectiveness and reliability. The evaluation of these types of after-treatment devices is beyond the scope of a part 7 approval program.

For the same reasons, the final rule does not adopt a commenter's suggestion that the particulate index for an engine be adjusted to reflect the use of a diesel particulate filter. Also, the particulate index for an engine is intended to be used by manufacturers and mine operators as an aid for, among other things, selecting appropriate after-treatment devices such as particulate filters. Therefore, under the final rule the particulate index for an engine will indicate the particulate contained in the raw engine exhaust.

Other aspects of the final rule will, however, recognize exhaust after-treatment controls. The positive effects of catalytic converters in lowering levels of harmful exhaust gases may be considered under § 75.325(i) for reducing the quantity of ventilating air required where multiple pieces of diesel-powered equipment are in use. Also, particulate filters can be effective in maintaining compliance with the respirable dust standard set by existing § 70.100.

During the course of this rulemaking, the question has been raised as to whether the final rule should require that some or all diesel engines be equipped with particulate filters. As noted above, MSHA encourages the use of such filters and other emission controls. However, the proposed rule did not raise this issue and MSHA received only limited comment regarding the appropriate role of diesel particulate filters. The final rule, therefore, does not require the use of these filters. However, MSHA is currently developing a proposed rule to address control of miners' exposure to diesel particulate. This rulemaking will afford an opportunity to fully develop this issue.

Other commenters suggested that diesel engine cooling system

components, such as radiators, not be included as part of the approval of diesel power packages so as to permit changes in cooling system components to be made in the field without affecting the engine's approval. The final rule does not adopt this suggestion. The inter-relationship of the components in the cooling system of a diesel engine is critically important to controlling power package surface temperatures, which, when elevated, can lead to a fire. Consequently, the engine cooling system components must be considered an integral part of a diesel power package. This aspect of the final rule does not prohibit field radiator changes, provided that the inter-relationship of the engine's cooling system components is maintained in approved condition.

A number of minor changes are made in §§ 7.97, 7.98, 7.100, 7.101, 7.102, and 7.103 of the final rule to clarify the requirements of these sections. Substantive changes to these sections are discussed in the section-by-section discussion which follows.

Section 7.95 Purpose and effective date. The final rule's part 7, subpart F approval requirements apply to diesel power packages intended for equipment used in areas of underground coal mines where this equipment is required to be permissible. The design, performance and testing requirements of this section are effective November 25, 1996. MSHA will begin accepting applications under new subpart F immediately. To accommodate all interests, the Agency also will complete any in-house part 36 safety component certification applications, or evaluate such applications under new subpart F, at the applicant's choice. As noted elsewhere in this preamble, the requirements for approved diesel power packages in equipment used in underground coal mines become effective in 3 years.

As noted above, several commenters urged that an extended phase-in period of several years be included in the final rule. According to the commenters, a phase-in period is needed to allow for the development of competent third-party testing facilities, particularly with respect to explosion-proof testing. Other commenters suggested that subpart F be made effective immediately, so as to accelerate conformance to the new requirements for the benefit of miners' safety.

A number of the final rule's test requirements can be performed effectively with inexpensive, simple test equipment or facilities, or with the power package installed in the mining equipment. For example, the static pressure test required by § 7.104 to evaluate the structural integrity of power package components can be performed using currently available hand pump devices. Likewise, explosion-proof testing can be performed in inexpensive test chambers of relatively simple design.

Nonetheless, MSHA recognizes that some testing capabilities are not immediately available in the private sector, such as surface temperature testing and exhaust gas cooling efficiency testing with methane gas injection in the intake air. To facilitate the approval of power packages and accommodate the needs of applicants, MSHA may be consulted for simple alternative procedures which can be used to provide the same results. In addition, MSHA will perform the tests required by subpart F for diesel power package approval at its Approval and Certification Center upon request by applicants. MSHA anticipates providing these test services, for the fees set in accordance with 30 CFR Part 5, for up to 3 years, or until private sector testing capability is available. MSHA reserves the right to determine when competent private sector testing capability is available and to discontinue MSHA testing.

Section 7.96 Definitions. In addition to the existing definitions in §§ 7.2 and 7.82, this section of the final rule sets out and clarifies the key terms used in subpart F.

Commenters did not direct specific attention to this aspect of the proposal. The final rule adopts the proposed definitions, with five exceptions, adds two terms and definitions, and deletes three definitions from the proposal which now appear in subpart E. These changes are intended to add flexibility to the final rule and respond to confusion among some commenters with respect to the substantive requirements of subpart F.

The definition for ''exhaust conditioner'' has been revised to remove the words ''corrosion-resistant.'' The requirement for the exhaust conditioner to be made of corrosion-resistant material is adopted from the proposal in § 7.98(s)(4)(i). The definitions for ''exhaust system'' and ''intake system'' are revised to include the phrase ''but is not limited to'', to recognize the use of components not otherwise mentioned in the definitions for these terms. The term ''explosive mixture'' has been changed to ''flammable mixture'' to conform with part 36, and the definition for this term has been modified with the non-substantive change of removing the word ''violently.'' The definition for ''fastening'' has been modified for the sake of clarity to remove the words ''device such as'' when referring to bolts, screws, or studs. The term ''high idle speed/no load'' has been revised to ''high idle speed.'' This is another non-substantive change, since ''no load'' is specified in the definition of the term. New definitions for ''dry exhaust conditioner'' and ''wet exhaust conditioner'' are added to the final rule to more clearly differentiate between the requirements for these systems. Under the final rule, a dry exhaust conditioner is defined as a device which cools exhaust gases without direct contact with water, such as a heat exchanger. A wet exhaust conditioner is defined as a system which cools exhaust gases through direct contact with water. Minor changes to the definitions for ''step (rabbet) joint'' and ''threaded joint'' have been made for the sake of clarity. The terms ''corrosion-resistant material,'' ''idle speed/no load,'' and ''rated speed'' and their definitions are deleted from subpart F. These terms are common to both subparts E and F, and have already been defined in subpart E. Section 7.96 has been modified to incorporate the definitions of subpart E, § 7.82.

Section 7.97 Application requirements. This section is derived from existing part 36 and requires that an application for approval of a diesel power package contain sufficient information to document compliance with the technical requirements of the final rule. The list of information specified for inclusion in the approval application, which is revised from the proposal in response to commenters and to fully identify the engine and the fan blade material, is intended to help applicants supply the data necessary for a prompt evaluation. The final rule permits applicants to submit composite drawings. This approach reduces paperwork, affords applicants flexibility in the preparations of their drawings, and has proven to be effective in other MSHA approval programs.

Like existing part 7 and other MSHA approval standards, the documentation formulated in the application process under § 7.97 forms the basis for MSHA's approval of a diesel power package. Approved diesel power packages must be manufactured in accordance with the specifications contained in the approval and, once put into service, approved power packages must be maintained and operated within the parameters set in the MSHA approval.

The paperwork hours in the approval application, including test requirements, are assigned OMB control number 1219–0100.

Section 7.98 Technical requirements. This section of the final rule sets specific technical requirements

for diesel power packages. Diesel power packages are intended for use with Category A engines so that they can be operated safely and not create a fire or explosion hazard. Consistent with the Advisory Committee's recommendation that permissible diesel equipment be required in areas of underground coal mines where permissible electric equipment is required, the final rule's technical specifications introduce many of the safety features currently required for permissible electric-powered equipment.

Like the proposal, the final rule is derived largely from existing technical requirements in part 36 for diesel-powered equipment intended for use in gassy non-coal mines. The final rule also addresses the hazard of combustible coal dust by specifying a maximum surface temperature of 302 °F (150 °C). This is the same technical requirement applied to permissible electric-powered equipment. Other aspects of the final rule set specifications necessary to control engine surface temperatures, sparking, and the passage of flame from the exhaust system or components to the external atmosphere. Any of these conditions could ignite an explosion or fire in the underground coal mine environment.

Commenters generally accepted the proposed technical requirements, which, as noted above, are based on long-standing regulations which have been proven effective and workable. Commenters did, however, raise several issues.

Some commenters sought wider tolerances for explosion-proof enclosures in diesel power packages, citing experience in the United States and Europe. These commenters directed their attention to the proposed specifications for joints in engine exhaust systems, and suggested that MSHA review the proposed specification of 0.004 inches for maximum clearance for joints all in one plane.

The final rule retains this specification, which has proven to be effective for decades. Commenters offered no basis for the recommendation for a wider tolerance.

Other commenters suggested that electric starting devices for diesel engines be prohibited. The proposed rule recognized the conventional use of hydraulic, pneumatic or other mechanically actuated starting mechanisms, but also retained the flexibility to evaluate other means of starting under § 7.107 of the rule concerning new technology. This aspect of the proposal differs from the existing part 36 regulations from which this proposal was derived.

The final rule is intended to serve as a flexible set of regulations that will continue to be workable over a period of years. Throughout the final rule MSHA has adopted the more current practices and, where appropriate, provides that alternatives may be developed which are safe and effective. With this in mind, the final rule does not expressly prohibit the use of electric starting devices for diesel engines, adopting the proposal to permit MSHA to evaluate other starting mechanisms. Such alternatives are subject to evaluation under § 7.107 and must be found by MSHA to be as safe as the pneumatic and hydraulic starting mechanisms presently in use.

Some commenters asked for clarification of proposed paragraph (i) with respect to the safety shutdown system required for diesel power packages. The safety shutdown system is required to automatically shut off the fuel supply and stop the engine in response to certain dangerous engine conditions. MSHA intended in the proposal, and the final rule clarifies, that the shutdown system must respond to both high exhaust temperature and low water level in the engine's exhaust conditioner. Either of these conditions can rapidly lead to a fire or explosion hazard.

In addition, the final rule has been revised from the proposal to cover other safety system shutdowns that may be installed by the applicant. Section 75.342 requires methane monitors on some permissible equipment, and the final rule requires permissible equipment to be provided with a fire suppression system meeting the requirements of § 75.1911. Both of these standards specify that the diesel engine must shut down when either an elevated level of methane is encountered or when the fire suppression system is actuated. This requirement will most likely be satisfied by a connection to the safety shutdown system. The technical requirements of this rule now cover these additional sensors.

Another commenter suggested that the safety shutdown system include automatic brake lock-up to prevent diesel-powered equipment from rolling. This aspect of a machine's safety is evaluated under the existing requirements of part 36 and is not part of a diesel power-package approval. Thus, the final rule does not adopt this suggestion.

The final rule adopts clarifying revisions in addition to changes made in response to commenters. In several instances more precise language is adopted to differentiate between requirements for wet and dry exhaust conditioner systems. Proposed § 7.98(d) has been revised in the final rule to refer to ''nonmetallic rotating parts'' instead of ''fans'', to conform with other MSHA regulations. Paragraph (p)(2)(ix) has been revised to require that the minimum thread engagement of fastenings must meet the requirements of the explosion tests in § 7.104. This is a correction. This change conforms to paragraph (p)(2)(viii), which requires both tests for acceptance of a minimum thread engagement of fastenings less than ⅜ inch. In addition, paragraph (q)(7) of the final rule does not retain the proposed requirement that a ''minimum of four fastenings'' be used for explosion-proof joints. MSHA's experience shows that flange designs with fewer than four fastenings have proven to be effective. Paragraph (r)(5) has been revised to note that the opening for connection of a gage to measure the intake vacuum must be closed by a plug or other suitable device that is sealed or locked in place except when in use. This language conforms to the language of part 36, and closing of this opening is necessary to perform certain tests in this subpart. Paragraph (s)(1) has been revised to require that the flame arrester prevent the discharge of glowing particles, conforming it to the requirement in part 36. Finally, paragraph (s)(5) has been revised to note that the opening for connection of a gage to measure the backpressure must be closed by a plug or other suitable device that is sealed or locked in place except when in use. This language also conforms to part 36, and is needed to perform some of the tests under this subpart.

Section 7.99 Critical characteristics. Critical characteristics, which are specified for all part 7-approved products, are those features or specifications which, because of their importance to proper operation of the equipment, must be inspected or tested on each unit manufactured. The proposal focused on power package features essential to preventing fires and explosions in the underground coal mine environment, such as flame-arresting path clearances and the explosion-proof integrity of the power package. Commenters did not direct their attention to this aspect of the proposal, which is adopted without change in the final rule.

Section 7.100 Explosion tests. This section describes the tests to be performed on diesel power packages to ascertain whether they are explosion-proof, as specified by the technical

requirements in § 7.98. Like the proposal, the final rule is derived from existing § 36.46. Using an explosive mixture of natural gas and air, or methane and air, the tests prescribed by the final rule determine the power package's integrity in the event of an explosion inside the intake or exhaust system. This could be caused by an engine backfire during starting or ingestion of methane into the engine while it is running. The prescribed tests determine whether flame arresters and joints are capable of preventing propagation of the internal explosion to the surrounding atmosphere. These tests also determine the lowest water level in the exhaust conditioner that will act effectively as a flame arrester, and the peak explosion pressures generated in each segment of the intake and exhaust system. Excessive pressures may be an indication of a design flaw.

Commenters did not raise issues regarding the proposed explosion tests. However, the final rule includes one change from the proposal to better ensure the ability of a diesel power package to withstand an internal explosion, and another change to revise the speeds at which dynamic tests are to be conducted. The final rule also includes non-substantive changes for clarification and to conform the final rule with existing MSHA regulations.

Paragraphs (a)(2) (v) and (vi) of the final rule specify an internal peak pressure of 110 psig instead of the proposed 125 psig, during power package explosion-proof testing. Excessive internal pressures during explosion-proof testing indicate the potential for failure of the diesel power package in use, with potentially catastrophic results in the underground coal mine environment. Lowering the peak pressure expected during explosion-proof testing recognizes that diesel power package designs differ and that it is difficult to select the optimum location for pressure measurements. When pressures greater than 110 psig are measured during testing, the final rule specifies redesign of the system to reduce the pressure or more rigorous testing to verify the integrity of the system. Due to the critical nature of this test, MSHA has adopted the same approach in its explosion-proof test requirements for electric motors. The final rule conforms these like requirements.

Paragraph (a)(2)(vii) of the final rule requires that dynamic tests be conducted at two speeds—1800±200 RPM and 1000±200 RPM—instead of at rated speed and 50 percent of rated speed specified in the proposal. The speeds set by the final rule correspond to the speeds at which dynamic tests are performed successfully at MSHA facilities. Also some test facilities may not be capable of performing tests at the rated speed called for by the proposal. This change is also reflected in paragraphs (a)(3)(iii) (A) and (B).

For clarification, the final rule also adopts more precise language to identify requirements which apply to wet exhaust conditioners, distinguishing them from dry systems. The final rule also defines natural gas that may be used in explosion-proof testing in a manner that better recognizes the variables in the make-up of the hydrocarbons found in natural gas. As a result, the final rule affords greater flexibility for manufacturers and testing laboratories.

Section 7.101 Surface temperature tests. This section describes the tests necessary to ascertain that diesel power packages will not create a fire hazard in underground coal mines due to coal dust or other combustible materials contacting hot surfaces. Like the proposal, the final rule is derived from § 36.48, and sets a maximum external surface temperature of 302 °F (150 °C). The test protocol simulates the operation of a diesel power package under heavy use conditions. A note has been added to this section to alert the applicant that this test may be done simultaneously with the exhaust gas cooling efficiency test described in § 7.102 of the final rule.

Commenters did not direct their attention to this aspect of the proposal. The final rule is unchanged from the proposal, except for a non-substantive clarifying change regarding wet exhaust conditioners and the elimination of the reference to the use of natural gas. A reference to natural gas, which consists primarily of methane, is redundant. Instead, the final rule specifies the percentage of methane to be added to the intake. Elimination of the reference to natural gas also conforms this section to similar tests, which also determine engine performance and which only specify methane, in subpart E of part 7.

Section 7.102 Exhaust gas cooling efficiency test. This section describes the test procedures for measuring the temperature of the exhaust gas at the discharge point from the exhaust conditioner. Acceptable performance under this test is exhaust gases that do not exceed 170 °F (76 °C) for power packages with a wet exhaust conditioner, and 302 °F (150 °C) for a dry system. The proposed and final rules are derived from existing § 36.47 and address the hazard of hot exhaust gases creating a fire or explosion hazard.

Commenters raised only one issue concerning this aspect of the proposal, suggesting clarification of the different performance requirements for wet and dry exhaust conditioners. The final rule adopts this suggestion.

Section 7.103 Safety system controls test. This section is derived from § 36.47 and describes tests to evaluate the performance of the safety shutdown systems required for diesel power packages. As discussed above, these systems automatically shut down a diesel engine in response to potentially dangerous conditions, such as overheating. The tests prescribed introduce failure modes, such as loss of engine coolant, and initiate the safety system. Acceptable performance is achieved when the safety system automatically shuts down the engine before the technical requirements for approval are exceeded.

Commenters recommended that the final rule more clearly delineate the different requirements for wet and dry exhaust conditioners. The final rule adopts this suggestion in paragraphs (a)(3), (a)(4), (b)(2), and (b)(3).

Commenters also suggested that paragraph (a)(7)(ii) be amended to include a caveat about the surface temperature of a turbocharger not exceeding 302° F (150° C). This comment is not adopted because the final rule addresses surface temperature control under § 7.101 and requires that all external surfaces of power packages, including turbochargers, not exceed 302 °F (150° C). Paragraph (b)(7) has been revised to accept starting mechanisms constructed of nonsparking materials in addition to starting mechanisms that prevent the engagement of the starter while the engine is running. This revision conforms to § 7.98(j)(1), which permits both options under the final rule, as it would have under the proposal.

Section 7.104 Internal static pressure test. This section describes tests to determine if the design of the intake and exhaust system components of diesel power packages is structurally sound. The prescribed tests specify internally pressurizing each segment of the intake and exhaust system. The pressure required to be applied is four times the maximum pressure observed in the tests performed under § 7.100, or 150 psig (±5 psig), whichever is less. Acceptable performance is based on an assessment of key points in the intake and exhaust system, such as joints and welds, for evidence of leakage or damage.

Commenters raised no issues with respect to the proposal. Paragraph (b)(2)(vi) has been added to limit

permanent distortion of any planar surface of the diesel power package to 0.04-inches/linear foot or less. This change conforms this requirement to the same requirement applied to the explosion tests in § 7.100(b)(7).

Section 7.105 Approval markings. This section requires that each approved diesel power package be identified with a permanent approval plate inscribed with the MSHA approval number. If the power package includes a wet exhaust conditioner that functions as an exhaust flame arrester, the final rule requires that the approval plate also indicate the grade limitation for the power package. This information is important so that users are aware of the maximum grade on which the exhaust conditioner will be effective as a flame arrester.

As noted elsewhere in this preamble, approval markings have been used for more than 85 years, and are routinely relied upon by users of mining equipment as well as state and federal authorities to identify equipment appropriate for use in mining.

Another commenter suggested clarification of the proposal with respect to the grade limitation for certain diesel power packages. The final rule has been revised in response to this commenter to clarify that the grade limitation applies to systems which use a wet exhaust conditioner as a flame arrester. No grade limitation is appropriate for power packages with a dry exhaust conditioner.

Burden hours required to make and mount MSHA approval plates are assigned OMB control number 1219–0100.

Section 7.106 Post-approval product audit. This section incorporates the standard audit requirement for part 7-approved equipment, specifying that approval holders must make a diesel power package available for audit by MSHA, at no cost to the Agency. The obligation to supply a power package under this section arises only upon request by MSHA, and is limited to no more frequently than one a year, except for cause. Under existing § 7.8(b), the approval holder may observe any tests conducted under the audit.

Post-approval audits are a critical part of MSHA's quality control program for approved equipment. By inspecting and testing a diesel power package for continuing compliance with the specifications for its approval potential problems can be detected and confidence in the approval process is maintained. Since the inception of post-approval product audits under part 7, MSHA has detected numerous discrepancies which have been effectively corrected.

Commenters directed no attention to this aspect of the proposal, which is adopted without change from the proposal.

Section 7.107 New technology. This section is designed to facilitate the introduction of new technology or new applications of existing technology. It allows MSHA to approve a diesel power package that incorporates technology for which the requirements of subpart F are not applicable, provided that MSHA determines the power package is as safe as one which meets the requirements of subpart F. To make this determination, MSHA develops appropriate technical requirements and test procedures when applications for the approval of novel designs are submitted. To provide confidence in the adequacy of the design, such tests may be required to be performed by MSHA. Experience with this provision under existing regulations has shown that technological innovations can be effectively evaluated and made available for use in a prompt fashion, thus serving the best interests of miners' safety and health. Commenters generally supported this aspect of the proposal, and the final rule adopts the proposal without change.

Section 7.108 Power package checklist. This section requires that approved diesel power packages be accompanied by a description of the features which must be checked and tests that must be performed to ascertain that the power package is in approved condition. These instructions, which are developed as part of the approval process, are intended to aid power package users in keeping this equipment in safe operating condition.

Commenters did not direct specific attention to this aspect of the proposal, which is adopted without change in the final rule.

Part 7, Subparts G, H and I

The final rule does not adopt proposed subpart G to part 7, nor further develops the advance notice of rulemaking published concurrently with the proposal concerning subparts H and I to part 7. Subpart G-approved power packages would have been required for nonpermissible, heavy-duty diesel-powered equipment used in underground coal mines. Subpart H would have established regulations for the approval of fully assembled permissible diesel-powered machines, and subpart I would have set requirements for the approval of fully assembled nonpermissible, heavy-duty diesel-powered equipment. In lieu of this approach, the final rule responds to the commenters who urged that safety and fire protection features for nonpermissible diesel-powered equipment be addressed in the Agency's part 75 safety standards for underground coal mines. Existing part 36 is retained by the final rule and revised to specifically apply to permissible diesel-powered equipment for use in underground coal mines. Subpart H is not further developed by the final rule.

In the proposal, subparts G and I were developed as an approach to several of the Advisory Committee's concerns. In its deliberations, the Advisory Committee considered the risk of fire on nonpermissible diesel-powered equipment caused by hot surfaces igniting combustibles such as hydraulic and lubricating oils, diesel fuel, and coal dust. To address this hazard, the Committee recommended limiting engine surface temperatures. Under the proposal, surface temperature controls and other machine safety features for heavy-duty nonpermissible diesel equipment would have been addressed in subparts G and I.

The Committee, however, also recognized the difficulty of applying such controls to all nonpermissible diesel-powered equipment, especially light-duty, utility equipment. The Advisory Committee, therefore, recommended that a ''limited class'' of light-duty equipment be identified for which less complex fire prevention measures would be required, such as fire suppression systems which shut down the engine, guarded drive shafts to prevent damage of fuel and hydraulic lines in the event of a shaft failure, protection of the fuel tank and lines, and proper design of the electrical system to prevent electrical arcs. The proposal included these requirements for a ''limited class'' of light-duty equipment in the part 75 safety standards for underground coal mines.

The Advisory Committee also examined what additional features should be included in the approval requirements for completely assembled units of diesel-powered equipment. The Committee recommended that MSHA develop an approval program that would emphasize other equipment safety features which could be readily addressed by equipment manufacturers. These features included safeguarding of the fuel system, an exhaust gas dilution system, a fire suppression system, and appropriate electrical and braking systems. As a completely assembled machine, the interrelationship of these systems would be evaluated as part of the approval process contemplated in the proposal under subpart H.

A number of commenters objected to the approval of nonpermissible diesel-

powered equipment. These commenters maintained that such an expansion of MSHA's approval process would result in regulating diesel-powered equipment differently than electric-powered equipment without justification, and would present severe technical and economic difficulties in meeting certain proposed requirements. The commenters recommended that the final rule adhere to the long-standing regulatory approach for electric-powered equipment, which sets performance-oriented safety requirements for nonpermissible equipment in the Agency's part 75 safety standards for underground coal mines. According to the commenters, this approach would be responsive to the hazards posed by diesel-powered equipment, and provide sufficient flexibility to facilitate the introduction of new and safer technology.

In contrast, one commenter urged that all diesel-powered equipment be approved as permissible, without regard to the equipment's use in the mine. This commenter pointed out that diesel-powered equipment presents different hazards than electric equipment, inasmuch as it contains both a fuel source and an ignition source. The commenter further maintained that permissible diesel-powered equipment receives better maintenance than nonpermissible equipment, and explosive accumulations of methane can be encountered anywhere in an underground coal mine. This commenter noted that since 1969, 10 explosions occurred in areas where nonpermissible equipment is permitted, and seven of these explosions were caused by equipment that was not maintained in permissible condition.

Another commenter agreed that heavy-duty nonpermissible equipment should have approved engines and power packages to limit harmful emissions from the engine and protect against the fire hazard presented by hot engine surfaces. This commenter, however, objected to MSHA approval of fully assembled nonpermissible machines as contemplated by subpart I.

MSHA acknowledges that fire prevention and other machine safety features can be successfully introduced for nonpermissible equipment, without a formal approval program. This regulatory approach has been effectively implemented through MSHA's part 75 safety standards for underground coal mines as they apply to nonpermissible electric-powered equipment. For example § 75.518 provides fire protection by requiring electrical system overload protection for nonpermissible electric-powered machines. Section 75.523–3 provides a machine safety feature by requiring automatic emergency parking brakes. Setting such performance-based requirements for nonpermissible equipment maximizes the flexibility afforded mine operators and manufacturers to minimize the hazards of this equipment, and facilitates the introduction of new technology for dealing with these hazards. For example, new heat insulating materials have been developed since the publication of the proposed rule, which can be used to control surface temperatures on diesel-powered equipment.

To adapt this regulatory approach to nonpermissible diesel-powered equipment, the final rule extends the proposal's safety requirements for limited class equipment. Under the final rule, nonpermissible diesel-powered equipment is not required to be approved by MSHA. Instead, this equipment must comply with the final rule's safety requirements in §§ 75.1909 and 75.1910. These standards include requirements for fire prevention and machine safety features such as protection of hydraulic, fuel and electrical systems and adequate brakes and operator controls.

Part 36

Existing part 36, previously known as schedule 31, has been in effect since 1961. It sets approval requirements and specifications for diesel-powered equipment used in ''gassy noncoal mines and tunnels''. The final rule retains these existing regulations as the basis for approval of diesel-powered equipment and, in lieu of further developing subpart H, includes amendments which expand part 36 to apply to equipment used in underground coal mines. Specifically, part 36 is amended to afford manufacturers the option of incorporating into their equipment part 7-approved power packages. Diesel-powered equipment with approved power packages will be suitable for use in areas of underground coal mines where permissible equipment is required. The existing part 36 approval requirements for diesel-powered equipment used in metal and nonmetal mines are unchanged by the final rule. Part 36-approved equipment with certified engines and safety component systems will continue to be recognized for use in metal and nonmetal mines where permissible equipment is required. MSHA will issue approval numbers that differentiate between equipment for use in coal mines and equipment for use in metal and nonmetal mines. Machines approved under revised part 36 specifically for use in underground coal mines will be identified with an MSHA approval number in a new sequence ''36c–''. This will indicate that the equipment has been approved for use in underground coal mines. A part 36 MSHA approval number in the sequence ''31–'' will indicate that the equipment has been approved for use in metal and nonmetal mines.

These changes are responsive to a number of commenters who urged that the existing part 36 regulations for the approval of diesel-powered equipment be retained and continue to apply to equipment for use in metal and nonmetal mines. In addition, the final rule expands the scope of part 36, eliminating the need for separate approval regulations for diesel-powered equipment for use in underground coal mines as contemplated by subpart H in the proposal.

To retain part 36 and include the approval of diesel-powered equipment for use in underground coal mines, the final rule re-titles part 36 and eliminates references to ''gassy noncoal mines and tunnels'' and related definitions. In addition, the application requirements of § 36.6 and design requirements of § 36.20 are revised to recognize the use of part 7-approved power packages, which substitute for §§ 36.21 through 36.26 (except §§ 36.25(f) and 36.43 through 36.48).

The final rule also updates part 36 in several respects. Section 36.20, concerning the quality of material, workmanship and design, is revised to eliminate an outdated reference to § 18.24 of part 18, schedule 2F. In its place, the final rule requires compliance with § 7.98 of the final rule, which provides structural and flame path requirements for explosion-proof enclosures. This aspect of the final rule reflects long-standing requirements for explosion-proof components.

The definition of ''low-volatile hydrocarbon (diesel) fuel'' in § 36.2(i) is deleted by the final rule. This definition is outdated and potentially confusing in context with § 75.1901 of the final rule, which specifies requirements for diesel fuel.

C. 30 CFR Part 70 Discussion

Section 70.1900 Exhaust Gas Monitoring

As outlined in the proposal, the Advisory Committee regarded the health effects of diesel exhaust as a key area of concern. In its final report, the Advisory Committee focused on two areas—exposure limits and a sampling strategy to monitor the concentration of diesel exhaust in miners' work environment.

The Committee recommended further research to develop information about diesel particulate exposure levels at which health effects accrue. The Committee also addressed gaseous diesel exhaust components, concluding that suitable protection for miners would be achieved by relying on coal mine air quality standards, either as they currently exist or may be revised in the future. The Advisory Committee further concluded that exposure limits for gaseous contaminants of diesel exhaust should not be unique from the exposure limits set by the same contaminants generated by other mining sources, such as blasting. The Committee specifically recommended a periodic sampling strategy for carbon monoxide, nitric oxide and nitrogen dioxide and sampling for sulfur dioxide if diesel fuel containing more than 0.25 percent sulfur is used. In addition, the Advisory Committee recommended a sampling strategy which utilized return air course samples to trigger personal exposure sampling. The Advisory Committee's recommendations served as the basis for the proposed rule.

The proposed rule did not contain a diesel particulate exposure standard. At the conclusion of their deliberations the Advisory Committee recommended that the Secretary of Labor set in motion a mechanism whereby a diesel particulate standard could be set, and that the Secretary work in concert with the Bureau of Mines (BOM) and the National Institute for Occupational Safety and Health (NIOSH) to develop a sampling strategy and a program for its implementation. Subsequent to those deliberations, MSHA has been working closely with the BOM and NIOSH to develop methods for measuring diesel particulate and for the development of criteria for reducing miners' exposure to diesel particulate. In 1991, MSHA issued an advance notice of proposed rulemaking seeking additional information for the development of a rule. MSHA also held three workshops in 1995 that provided a forum for mine operators, labor unions, trade organizations, engine manufacturers, fuel producers, exhaust after-treatment manufacturers, and academia, to present and discuss information about technologies and approaches that can be utilized to limit the exposure of miners to diesel particulate. MSHA is currently using the information obtained from the advance notice of proposed rulemaking and the workshops to develop a proposed rule for reducing miners' exposure to diesel particulate.

The proposal generally followed the Advisory Committee recommendations for sampling and permissible exposure limits. Under the proposal, samples of carbon monoxide, nitric oxide and nitrogen dioxide would be taken weekly in the immediate return airways of each split of air where diesel equipment is used. When sampling results exceeded 50 percent of any permissible exposure limit set by the proposal, personal exposure monitoring would have been required. If personal exposure samples showed concentrations which exceeded 75 percent of the permissible exposure standard, sampling would continue each operational shift until, with 95 percent confidence, it was established that exposure was at or below the permissible level.

Commenters to the proposed rule generally accepted the need for regular sampling to evaluate miners' working conditions for the presence of potentially harmful gaseous diesel exhaust components. A number of commenters, however, noted that the proposed rule was too focused on sampling, and gave inadequate attention to requiring corrective action.

Some commenters recommended an alternative to sampling in return air courses. These commenters suggested a personal sampling approach keyed to the person in each mechanized mining unit likely to experience the highest diesel exhaust exposure. This ''designated occupation'' would be identified in the mine's ventilation plan. According to the commenters, this approach would recognize differences in mine configuration and mining methods.

Some commenters considered the proposed action level for area samples, set by the proposal at 50 percent of the permissible exposure limit values for the gaseous emission components being measured, to be reasonable. One commenter, in support of the action level concept, noted that sampling in the immediate return air course would measure the contribution of all diesel equipment on the mining section, thereby yielding readings that would give reasonable assurance that miners working on the section were protected.

Other commenters considered the 50 percent action level possibly too low for mines with naturally occurring ambient levels of carbon monoxide near the action level. Some of these commenters also foresaw possible problems at mines operating near the 50 percent action level. These commenters were concerned that an unnecessarily burdensome cycle of area sampling followed by personal sampling could result. Commenters also noted that the 50 percent action level could be raised because the permissible exposure limits themselves include a safety factor. No commenters offered data or specific support for a particular action level.

Commenters also expressed concern about how effectively the proposed sampling procedures would address variations in the concentration of diesel exhaust in miners' workplaces. A number of commenters suggested different strategies with more frequent samples to better monitor the presence of the gaseous components of diesel exhaust. Some commenters suggested special sampling to evaluate peak exposure when, for example, equipment was operated under load. Other commenters opposed such an approach, citing difficulties in determining when peak conditions might occur. Another commenter recommended, in addition to weekly samples in return air courses, weekly personal samples of each diesel equipment operator, and at the same time samples for at least two miners working inby all pieces of diesel equipment on the same split of air. According to this commenter, the suggested sampling strategy would yield better information about what diesel exhaust control measure modifications may be needed. Other commenters noted the dynamic nature of the underground mining environment, which varies the concentrations of diesel exhaust in miners' workplaces. These commenters recommended sampling be performed every shift in miners' work areas to timely detect the onset of elevated levels of diesel exhaust contaminants.

A number of commenters also noted that, in addition to sampling in the immediate return air course, attention should be given to the area of the section loading point. According to these commenters, diesel exhaust contaminants are often elevated at this location due to high engine loads at a single stationary point. Commenters also noted the need to address situations when diesels are used in locations outby the working faces. According to these commenters, construction projects can involve significant diesel usage at some mines.

The proposed rule did not specify sampling methods for evaluating the gaseous components of diesel exhaust. In the preamble discussion to the proposal, however, MSHA made reference to electrochemical analyzers and detector tubes as technology that could be used to determine concentrations of the gases to be measured. Commenters did not suggest specific sampling methods or object to those mentioned in the preamble discussion. Some commenters, however, emphasized that the methods chosen should not be highly technical in

nature. Several commenters urged that the task of sampling be something miners generally could perform with proper training.

As discussed elsewhere in this preamble, the final rule as a whole is designed to lay a foundation for the safe and healthful operation of diesel equipment in the confined, potentially explosive underground coal mine environment. To accomplish this objective, the final rule sets standards for diesel engines, suitable for mining. For the operation of this equipment, the final rule sets practicable standards for the use of low sulfur fuel and for adequate ventilation and proper maintenance of diesel equipment. These standards are intended to work together as an operating system to create a more healthful and safe working environment for miners.

Paragraph (a) of the final rule adopts a streamlined sampling strategy that is keyed to this operating system approach. The requirements of proposed § 70.1900 have been revised in the final rule to integrate sampling for gaseous components of diesel exhaust with existing on-shift workplace examination requirements and to take advantage of modern sampling instrumentation. The final rule also incorporates by reference the threshold limit values (TLV®'s) adopted by the American Conference of Governmental Industrial Hygienists (ACGIH). These TLV®'s are also incorporated by reference in MSHA's existing standards for exposure limits in § 75.322. The final rule retains the proposed action level concept with some modifications responsive to commenters. However, the final rule does not adopt the proposed requirement that area samples over the action level trigger personal sampling. Instead, paragraph (c) of the final rule requires corrective action to be taken immediately to reduce gaseous diesel exhaust concentrations to or below the action level. The final rule's sampling requirements are intended to provide a regular and timely check on how the total operating system of diesel exhaust control is working, with an emphasis on prompt corrective action.

Although the final rule does not require personal sampling, existing standards regulate miners' exposure to harmful airborne contaminants. These standards do not permit miner exposures over the established TLV®'s incorporated in this section of the final rule and in § 75.322. MSHA enforces these standards during mine inspections through personal and other sampling methods.

Like the proposal, paragraph (a) of the final rule specifies area samples in the ventilation return airways of each working section where diesel equipment is used, at a location which represents the contribution of all diesel equipment on the section. This approach was recommended by the Advisory Committee, and generally was supported by the commenters. In response to commenters, the final rule also requires samples in the area of the section loading point if diesel haulage equipment is operated on the working section, and at the point inby the last unit of diesel equipment on the longwall or shortwall face where mining equipment is being installed or removed. Depending on the mining system used, these are strategic locations in which to take area samples to evaluate the overall effectiveness of the control measures for diesel exhaust.

In addition, the final rule authorizes the MSHA district manager to specify area samples at other strategic locations on a mine-by-mine basis in order to accommodate circumstances which can result in significant concentrations of diesel exhaust. This aspect of the final rule responds to commenters' concerns about situations which can involve significant diesel usage in areas outby the working face, such as construction projects. The paperwork aspect of this provision results in a minimally increased burden since existing § 75.370 of this chapter requires that all underground coal mines have ventilation plans. Although this provision of the final rule is new, proposed § 75.390(b) would have required that the mine operator include certain minimum ventilation quantities in the mine's ventilation plan. Under the proposal, these minimum air quantities would have been related to the number of diesel-powered units operating and the air quantity necessary to control gaseous diesel emissions. Thus, this final rule provision is consistent with proposed § 75.390(b).

Monitoring of gaseous diesel exhaust components during the on-shift examination required by existing § 75.362 of this chapter makes checks for diesel exhaust concentrations part of the workplace examinations which have been historically conducted in the coal mining industry. On-shift examinations are designed to detect hazards which can develop during a working shift when normal mining operations are underway. Such examinations include tests for methane gas accumulations and oxygen deficiency, and determinations of air direction and velocity. Tests for diesel exhaust gases can be readily made during the on-shift examination by the same mine personnel. Currently, multi-gas detectors are available and in use in a significant number of mines in the industry which can sample simultaneously and directly read out results for methane, oxygen, carbon monoxide and nitrogen dioxide. Making checks of the mine's diesel exhaust control system part of the existing practice of on-shift examinations minimizes the burden of compliance with the final rule's sampling requirements. Under the final rule, special staff and a separate diesel exhaust sampling schedule should be unnecessary.

Sampling as part of the on-shift examination also increases the frequency of diesel exhaust concentration monitoring from the proposed weekly schedule, and responds to commenters who questioned the adequacy of the proposal in this regard. The final rule's increased frequency of sampling affords more timely and meaningful information about the performance of the mine's overall diesel exhaust control system. Diesel equipment is highly mobile and the mining environment changes rapidly as mine development progresses. Monitoring each shift alerts the mine operator to emerging problems with the control of diesel exhaust, before miners are overexposed to harmful contaminants.

Consistent with existing § 75.362 of this chapter, the final rule also requires sampling to be performed by a certified person designated by the operator. This aspect of the final rule is generally consistent with the proposal as it requires that competent persons perform the sampling, the results of which form the basis for important decisions about miners' work environments.

Under the final rule, sampling would be required for two gaseous components of diesel exhaust: carbon monoxide and nitrogen dioxide. The final rule does not retain the proposal for sampling sulfur dioxide when diesel fuel containing more than 0.25 percent sulfur is used. Section 75.1901 of the final rule requires the use of low-sulfur fuel at all times, rendering this aspect of the proposed rule unnecessary. The final rule also deletes the proposed requirement for sampling nitric oxide.

Both carbon monoxide and nitric oxide are produced in significant quantities when diesel engines operate under load. Elevated carbon monoxide is also indicative of engine faults such as misadjusted fuel systems, failure to derate engines for altitude, or dirty air cleaners. Conditions of use such as prolonged diesel engine idling can also produce elevated levels of carbon monoxide. Catalytic converters, designed to remove carbon monoxide

from the exhaust, work poorly under these conditions due to lower equipment operating temperatures.

Nitric oxide concentrations generally do not reflect engine faults. In addition, nitric oxide is readily converted to nitrogen dioxide in the mine atmosphere, making representative measurement difficult under the final rule's area sampling strategy. Also, in MSHA's experience the TLV® for carbon monoxide will be exceeded before the TLV® for nitric oxide. Sampling for nitric oxide, therefore, is not retained in the final rule.

The final rule also requires sampling for nitrogen dioxide. Nitrogen dioxide is readily detectable and potentially harmful to miners. The TLV® for nitrogen dioxide is 5 parts-per-million (ceiling), which cannot be exceeded at any time. Therefore, the final rule adopts the proposed requirement to sample for nitrogen dioxide.

The final rule addresses the collection of carbon monoxide and nitrogen dioxide samples with performance-based requirements. In response to commenters, the task of sampling is significantly simplified. The sampling requirements also emphasize prompt availability of sample results, consistent with the final rule's emphasis on corrective action to protect miners from the risk of overexposure.

Paragraph (b)(1) provides that monitoring of carbon monoxide and nitrogen dioxide is to be performed in a manner which makes the results available immediately to the person collecting the samples. This aspect of the final rule recognizes that direct-readout sampling instruments are now available that can measure carbon monoxide and nitrogen dioxide. Use of these hand-held instruments requires no specialized technical background so that persons may be easily trained to perform this task. Mine-wide monitoring systems, with properly located sensors, could also be employed to collect the required carbon monoxide and nitrogen dioxide samples.

Paragraph (b)(2) of the final rule generally adopts the proposal, and specifies that samples are to be collected by appropriate instrumentation that has been maintained and calibrated in accordance with the manufacturer's recommendations. These provisions establish sound practices necessary for accurate sample results, while retaining the flexibility for new instrumentation that may be developed in the future.

Paragraph (b)(3) requires that samples be collected during periods that are representative of conditions during normal operations. This aspect of the final rule is consistent with the proposal and serves the underlying purpose of the sampling requirements, which is to gauge the performance of the diesel exhaust control system under normal operating conditions. Like the proposal, the final rule does not prescribe special requirements to measure the performance of the diesel exhaust control system under peak load conditions. As some commenters noted, determining when peak load conditions occur would be difficult to predict. In addition, such an approach would increase the complexity of the final rule unnecessarily.

Regular sampling during on-shift examinations will afford a realistic picture of the performance of the diesel operating system. To meet the requirement that samples be taken during periods that are ''representative of conditions during normal operations,'' MSHA intends that tests for carbon monoxide and nitrogen dioxide be made when diesel-powered equipment is being used as it typically is in the mining process. Thus, for example, sampling is appropriate when diesel haulage equipment is moving coal or diesel-powered roof bolters are installing bolts.

Some commenters noted the need to monitor exhaust concentrations during longwall moves with diesel-powered equipment, expressing concern that moving the component parts of a longwall to a new block of coal for mining can involve heavy usage of diesel equipment over the course of multiple shifts. As a result, miners could be exposed to elevated levels of diesel exhaust gases. The final rule addresses these comments through the increased frequency of samples to monitor diesel exhaust gases. On-shift examinations are required under § 75.362 of this chapter when longwall moves are being performed and, under the final rule, tests of the concentrations of carbon monoxide and nitrogen dioxide are required at the point immediately inby the last piece of diesel equipment on the longwall or shortwall face. If these samples indicate carbon monoxide and/or nitrogen dioxide concentrations greater than the action level, immediate corrective action is required. This approach protects miners through early detection of elevated concentrations of diesel exhaust gases, and prompt adjustments to the mine's diesel exhaust controls.

Paragraph (c) of the final rule is modeled after other MSHA standards for potentially hazardous gases, such as methane, and requires immediate corrective action when sample results indicate gas concentrations exceeding the action level. This change in the proposal is responsive to commenters who pointed out that the proposal gave inadequate attention to corrective action. The final rule retains the proposed action level concept tied to the TLV®'s for carbon monoxide and nitrogen dioxide. The exposure limits incorporated are those already incorporated in existing § 75.322 of this chapter. These exposure standards are based on the 1972 threshold limit values set by the American Conference of Governmental Industrial Hygienists (ACGIH) and have applied to underground coal mines for nearly 25 years. This aspect of the final rule comports with the recommendation of the Advisory Committee that gaseous diesel exhaust components not be treated differently from contaminants generated by other mining sources. The final rule does not adopt updated permissible exposure standards at this time, as referenced in the proposal, because this issue remains in the rulemaking process for Air Quality standards.

Under paragraph (c) of the final rule, the action level is set at 50 percent of the TLV®'s for carbon monoxide and/or nitrogen dioxide for samples collected in the areas identified in paragraph (a). As noted in the proposed rule, an action level is used to minimize the risk that workers will be overexposed. An action level is not a compliance limit for miners' exposure. Instead, an action level is intended to provide a timely trigger for reviewing the mine's diesel exhaust control system. Exceeding an action level under the final rule is not, by itself, a violation.

The 50 percent action level concept is well-recognized in industrial hygiene practice as an effective, practical screening tool for minimizing the risk of workers' overexposure. This approach, based largely on statistical considerations, was developed by the National Institute for Occupational Safety and Health (NIOSH) for regulations promulgated by the Occupational Safety and Health Administration (OSHA), ''Leidel et al., NIOSH Publication No. 77–173.''. It is designed to afford a single value trigger for simplicity of application and to reduce exposure monitoring burdens. ''Patty's Industrial Hygiene and Toxicology, 1994, p. 528.'' Based on the work of Nelson A. Leidel and others, the 50 percent action level is considered a reliable indicator that there is a low probability of worker exposures which exceed the TLV® linked to the action level.

The action level of 50 percent of the TLV®'s for carbon monoxide and nitrogen dioxide is well-suited to the

purposes of this final rule, and will afford miners protection from overexposure to potentially harmful diesel exhaust emissions. Samples collected in accordance with paragraph (a) of this section will yield results showing the concentration of diesel exhaust emissions in key places under representative conditions on a regular basis. Applying the 50 percent action level to these routine sample results will account for sources of variability affecting miners' exposure, such as the diesel activity level, ventilation rates, and duty cycles. The action level also provides a simple means of evaluating the status of the mine's overall diesel exhaust control system. As discussed elsewhere, this operating system approach to the control of diesel exhaust emissions is a key underpinning of the final rule.

The final rule also permits adjustments to the 50 percent action level on a mine-by-mine basis. Under § 75.325(j) of the final rule the MSHA district manager may approve an alternative action level in the mine's ventilation plan. Ventilation plans are required for all underground coal mines by existing standards under § 75.370 of this chapter. Under the final rule, any change in the 50 percent action level must be based on the results of sampling which demonstrate that miners' personal exposure will not exceed the applicable TLV®. Thus, a mine operator may show that a 60 percent action level, for example, is appropriate for the miners working on a section. To do this, the operator must demonstrate through sampling that miners working on the section are not overexposed to diesel exhaust gases when samples in the immediate return air course show that concentrations of carbon monoxide and/or nitrogen dioxide are maintained at 60 percent of the TLV®. Based on this data, the 50 percent action level could be revised, with the approval of the district manager. The higher action level would be made part of the mine's approved ventilation plan and, thereby, become a compliance requirement at the mine. If, with experience, the revised action level was shown to be inappropriate, changes would be made through the mine ventilation plan approval process. Mine ventilation plans are required by existing standards to be reviewed at least every six months.

The sampling necessary to demonstrate that the personal exposure of miners would not exceed the TLV® is not specified by the final rule, recognizing that many approaches can be taken. For approval to revise an action level, however, MSHA will require clear evidence that a proposed change in an action level is appropriate. As discussed above, the purpose of an action level is to trigger a review of the mine's diesel exhaust control system before miners are overexposed to harmful gases. As the action level is raised closer to the TLV®, the reliability of the action level as a timely warning diminishes. Thus, MSHA does not anticipate approval of action levels that provide a nominal margin of protection.

The final rule does not specify what corrective action is required when an action level for carbon monoxide and/or nitrogen dioxide is exceeded. Instead, this determination is to be made by the mine operator, who is in the best position to implement changes appropriate to the situation and sufficient to promptly return carbon monoxide and/or nitrogen dioxide concentrations to or below the applicable action level. Corrective action may involve addressing ventilation deficiencies, controlling the number of diesel machines operating in an area, or correcting engine faults. Elevated levels of carbon monoxide and/or nitrogen dioxide may indicate that appropriate corrective action is revision of the mine's ventilation plan. Modifying the mine's ventilation plan integrates needed controls into the operating system for the mine.

The final rule does not retain the proposed requirement to conduct personal sampling when the action level for gaseous diesel exhaust components is exceeded. Proposed § 70.1901 therefore is not included in the final rule. While the Advisory Committee recommended a two-tiered approach of area sampling which could trigger personal sampling, MSHA believes that the final rule's sampling strategy will better protect miners. As discussed above, the sampling strategy adopted focuses on the performance of the mine's control system for diesel exhaust, rather than measurements of individuals' exposure levels. This approach safeguards miners from overexposure by frequent testing for gaseous diesel exhaust components in key areas, and establishing action levels for initiating corrective action that responds to emerging problems. In addition, MSHA mine inspections will include regular checks on miners' exposure to harmful airborne contaminants, including carbon monoxide and nitrogen dioxide, as part of determining compliance with the TLV®'s in § 75.322 of this chapter. MSHA's current practice is to sample, at least annually, all diesel equipment occupations on each mechanized mining unit. It is MSHA policy to also sample half of the diesel equipment occupations in areas outby the face. As a result, MSHA is confident that miners will be adequately protected.

The final rule changes also respond to commenters who objected to the proposed personal monitoring requirements as fostering excessive sampling. In its guidance comments, the Office of Management and Budget counseled that the criteria for personal monitoring had the potential for an unnecessarily burdensome paperwork loop in which a mine would be required to conduct area sampling one week and personal sampling the next week. Other commenters also foresaw the potential for a cycle of area sampling followed by personal sampling, particularly at mines with naturally occurring high levels of carbon monoxide. These commenters also objected to the proposal that when personal exposure monitoring results indicate levels greater than 75 percent of the permissible exposure limit, such sampling would be required to continue on each operational shift until compliance was established with 95 percent confidence. By focusing the final rule's sampling requirements on monitoring the performance of the mine's diesel exhaust control system and taking timely corrective action, this potential problem is eliminated.

The proposed rule recordkeeping requirements were tied to MSHA's proposed Air Quality standards in §§ 72.200 (d), (e), (f) and (g) of this chapter. Commenters objected to the proposal's reference to MSHA's proposed Air Quality standards concerning exposure monitoring and referenced the comments they had submitted on those proposed rules. Under the proposal, the results of miners' personal samples were to be maintained for 5 years and include personal identification information as well as data about sampling location, duration, and results. The proposed requirements also required a record of the corrective action taken if miners' exposure readings exceeded the permissible limit. In addition, the proposed rule set requirements for access to miners' personal exposure records, provided miners or their representatives with the opportunity to observe monitoring, and called for notification of miners when samples indicate they have had exposures exceeding the permissible limit.

In the Air Quality rulemaking, commenters objected to MSHA's proposal that adjustments to calculations of exposure be made for novel workshifts when a miner worked longer than eight hours. Commenters also objected to mine operators having to take corrective action to reduce

exposures based on one sample showing overexposure. In addition, commenters objected that it was burdensome to include the mine operator's corrective action in exposure monitoring records. Other commenters supported this requirement. These commenters further stated that the period for record retention should be 30 years for epidemiological purposes and to be consistent with the Occupational Safety and Health Administration's general industry requirements.

For the reasons discussed above, the final rule re-focuses sampling for the gaseous components of diesel exhaust on early detection of diminishing performance of the mine's diesel exhaust control system. As a result, personal samples are not required. Certain limited recordkeeping is, however, necessary to support the final rule's objective of tracking the performance of the mine's diesel exhaust control system. To accomplish this objective with the least recordkeeping burden, paragraph (d) of the final rule revises the recordkeeping requirements of the proposal, conforming them to the existing requirements for on-shift examinations. Under the final rule, a record is required to be made of the results of samples taken under this section which exceed the applicable action level for carbon monoxide and/or nitrogen dioxide. Like the proposal, the data to be recorded under the final rule include the location where the sample was taken; the concentration of carbon monoxide and/or nitrogen dioxide measured; and the corrective action taken to reduce the concentration of carbon monoxide and/or nitrogen dioxide to below the applicable action level. A record of the instrumentation used, which would have been required under the proposal, has not been adopted in the final rule, because this is not essential information under the sampling scheme of the final rule.

This aspect of the final rule is intended to minimize recordkeeping by requiring a record only when sample results are over the appropriate action level. This information is key to an effective monitoring system and provides essential data for assessing how the mine's diesel exhaust control system is functioning.

For ease of administration by mine operators, the final rule specifies that recordkeeping under paragraph (d) follow the same requirements contained in existing § 75.363 of this chapter. These standards prescribe the recordkeeping requirements for hazardous conditions found during a shift, including on-shift examinations. Section 75.363 of this chapter requires that the record be kept in a book maintained for the purpose on the surface of the mine, and that the record be completed by the end of the shift. Section 75.363 requires that the record be made by the certified person who conducted the examination, or a person designated by the operator. In the latter case, the certified person must verify the record by the end of the shift. Records made under § 75.363 also must be countersigned by the mine foreman or equivalent mine official by the end of the mine foreman's or equivalent mine official's next regularly scheduled working shift. These features of § 75.363 emphasize the importance of mine management using and responding to data about working conditions in the mine.

Section 75.363 also recognizes the use of electronic recordkeeping technology, provided it is made secure and not susceptible to alteration. MSHA encourages the use of such systems to ease recordkeeping burdens and facilitate analysis of this important information.

The final rule does not retain certain proposed recordkeeping requirements which related to personal exposure monitoring. These include notification of miners if they are exposed over permissible limits, the opportunity for miners to observe personal monitoring being conducted, and access to personal exposure records by miners and their representatives. Since personal sampling is not required by the final rule, these provisions of the proposal are no longer appropriate.

The final rule does, however, make results from area samples required by this section available for inspection by miners' representatives and MSHA inspectors through § 75.363 of this chapter. This aspect of the final rule is consistent with the statutory role of miners' representatives and facilitates meaningful mine inspections. The retention period for the records required by paragraph (d) is at least one year, through the existing requirements of § 75.363 of this chapter.

Paragraph (e) of this section of the final rule provides that exhaust gas monitoring be conducted in accordance with § 70.1900 as of 12 months after the publication date of the rule. This compliance deadline should provide mine operators with adequate time to implement the requirements of this section, and corresponds to the 12-month compliance deadline for the new ventilation requirements for diesel-powered equipment in § 75.325 of the final rule. Persons who are qualified to take the required gas measurements should be available at the mine, given the fact that air sampling for other gases, such as methane, is already required.

D. 30 CFR Part 75 Discussion.

Section 75.325 Air Quantity

Diesel engines produce exhaust containing carbon monoxide, the oxides of nitrogen, and particulate matter, presenting potentially serious health risks to miners. Ventilation systems at underground coal mines where diesel-powered equipment is operated must be designed to dilute and carry away diesel exhaust contaminants, to ensure that miners' exposure to contaminants is maintained within acceptable limits. This portion of the final rule establishes minimum air quantity requirements in areas of underground coal mines where diesel-powered equipment is operated. These requirements recognize that effective mine ventilation is a key component in the control of miners' exposure to diesel exhaust contaminants.

Air quantity requirements for diesel equipment were proposed in § 75.390. Under the final rule these requirements have been consolidated with the other air quantity requirements for underground coal mines located in existing § 75.325.

The final rule provides that the minimum air quantity required to ventilate an individual unit of diesel-powered equipment is the quantity listed on the equipment approval plate. The approval plate quantity, which is calculated under § 7.88 of the final rule for each engine model, is the amount of air necessary to dilute carbon monoxide (CO), carbon dioxide (CO_2), nitric oxide (NO), and nitrogen dioxide (NO_2) to the levels set by existing § 75.322 for those gaseous contaminants. This ventilation rate must be displayed on the engine's approval plate. The approval plate air quantity must be maintained: in any working place where an individual unit of diesel equipment is being operated; at the section loading point during any shift the equipment is being operated on the working section; in any entry where equipment is being operated outby the section loading point in areas of the mine developed on or after the effective date of the final rule; and in any air course with single or multiple entries where equipment is being operated outby the section loading point in areas of the mine developed prior to the effective date of the final rule. The district manager may also designate, in the ventilation plan, additional locations where minimum air quantities must be maintained for individual units of equipment.

In areas of the mine where multiple units of diesel-powered equipment are operated, the final rule provides that the minimum air quantity will be the sum of the approval plate air quantities of all of the equipment. The air quantity must be maintained in the last open crosscut of each set of entries or rooms in each working section; in the intake, reaching the working face of each longwall; and at the intake end of any pillar line. The final rule allows certain types of equipment to be excluded from the multiple unit calculation for air quantity, based on the fact that the emissions from those types of equipment would not significantly affect the exposure of miners to contaminants. The final rule also authorizes the district manager to allow reduced air quantities in the ventilation plan for multiple units of diesel-powered equipment, if the mine operator presents evidence that justifies the reduction. Under this section mine operators are also permitted to obtain district manager approval for an action level other than the 50 percent level specified in § 70.1900, if evidence submitted by the mine operator supports such a change.

The Diesel Advisory Committee recommended that MSHA establish minimum ventilating air quantities for areas of the mine where diesel-powered equipment operates, and that these minimum quantities be specified in the mine operator's ventilation plan. The Advisory Committee further recommended that required air quantities be based on the approval plate air quantities, with appropriate provisions made to address multiple units of equipment in the same air course. The Committee also concluded that allowances should be made for adjustment to minimum air quantities, if operating experience and workplace sampling indicate that such an adjustment is appropriate. Finally, the Committee recommended that a particulate index be developed for each piece of diesel-powered equipment and be reported on the engine approval plate.

Under the proposed rule, the minimum quantity of air in any split of air where an individual unit of diesel-powered equipment was operated would have been the approval plate air quantity. The minimum air quantity on any split of air where multiple diesel units were operating would have been calculated using the sum of 100 percent of the highest approval plate air quantity, 75 percent of the second highest approval plate air quantity, and 50 percent of any additional approval plate air quantities. This was referred to as the ''100–75–50'' approach during the public hearings and throughout the rulemaking process. Minimum air quantity requirements would also have applied when face equipment was being installed or removed.

The proposed rule would also have established a minimum ventilation quantity based upon the particulate index determined for each type of diesel engine. The particulate index would have specified the quantity of air needed to dilute the diesel particulate matter generated by the specific engine to 1 milligram per cubic meter of air. In some cases the minimum air quantity derived from the particulate index would have been greater than the air quantity specified on the machine approval plate.

A major concern of many commenters was the use of approval plate air quantities in establishing ventilation requirements for both individual and multiple units of diesel-powered equipment. A number of commenters stated that the air quantities specified on engine approval plates are not always necessary to dilute contaminants generated by the equipment to permissible levels. Several commenters expressed concern that the proposal represented a simplistic approach to complex issues, given the great variety of ventilation systems in underground coal mines.

Some commenters stated that determining minimum air quantities on a mine-by-mine basis was more appropriate than the across-the-board approach taken in the proposal. Most of these commenters stated that if a mine's air quality is acceptable, air quantity should not be an issue, advocating a performance-based approach. These commenters believed that the final rule should give mine operators much more flexibility than the proposal would in designing their ventilation systems.

A number of these commenters recommended that approval plate quantities be used only as a guideline for determining minimum air quantities for diesel equipment, and that a number of other variables be taken into account in determining the quantity of air needed to dilute exhaust contaminants. Commenters stated that such variables should include the minimum volume and velocity of air proposed by the mine operator; the number of diesel-powered units operating on the section; the equipment approval plate quantities; the duty cycles of the equipment; and the duty cycles of equipment that is not typically operating, such as equipment used for longwall moves.

Some commenters recommended the exclusion of certain equipment, such as limited class equipment and equipment that is vented directly into return air courses, from minimum air quantity calculations. Commenters also suggested that administrative and engineering controls designed to maintain contaminant levels within acceptable limits, as well as respiratory protection practices implemented at the mine, should be taken into account in calculating minimum air quantities.

One commenter pointed out that an engine's approval plate air quantity is based on the worst point of the operational range of the engine. The commenter further stated that this engine rating fails to take into account a number of factors that affect the gaseous emissions levels actually discharged into the mine environment, including the equipment power package; the engine duty cycle; the mine's elevation; the fuel used; and equipment maintenance.

Other commenters stated that the proposal would give no credit to mine operators who used low emission technology, and that consideration should be given to calculating approval plate quantities after rather than before exhaust gases are treated. Other commenters stated that approval plate air quantities were well below average ventilation quantities currently provided in any given split of air.

The final rule does not incorporate the approach advocated by several commenters for individual units of diesel-powered equipment. Instead, paragraph (f) adopts the proposed requirement and provides that the minimum ventilating air quantity where an individual unit of diesel- powered equipment is operated is the approval plate air quantity.

Although commenters are correct in stating that the goal of air quantity requirements is to ensure that exhaust contaminants produced by the diesel engine are diluted to within acceptable limits, thereby preventing overexposure of miners, a pure performance-oriented approach, based on sampling to determine whether contaminants are within acceptable limits, is not the best way to achieve this goal. Elimination of minimum air quantities and adoption of the performance-based scheme advocated by some commenters would by necessity demand an extensive and burdensome regimen of personal sampling to ensure that miners are not being overexposed. In contrast, the mandatory minimum ventilating air quantities in the final rule will give reasonable assurance that contaminant levels are being adequately controlled, while the sampling that an operator must perform has been minimized. The

amount of air required by the approval plate quantity to ventilate a diesel engine is a scientifically-based determination of the minimum air needed to maintain gaseous contaminants, particularly NO_2, within acceptable limits and avoid overexposures of miners. The sampling under the final rule confirms that the integrated system of protections—diesel engines that are well maintained and effectively ventilated—continues to function as intended.

The approach taken by the final rule is an effective method of minimizing miners' exposure to unhealthful diesel emissions. As explained above, the approval plate air quantity is derived from a mathematical determination of the amount of air that is needed to dilute CO, CO_2, NO, and NO_2 to the TLV®'s established in existing § 75.322, which have applied in underground coal mines for the last 25 years. The TLV®'s for these contaminants, with the exception of NO_2, are time-weighted averages, which means that the average concentration of the contaminant over an 8-hour period must be within allowable limits, although the levels of these contaminants may spike up significantly in excess of the TLV® in short excursions over the measurement period. In contrast, the NO_2 limit of 5 parts per million is a ceiling limit, which means that concentrations of NO_2 must never exceed the TLV®, even for a brief period of time. This is because elevated concentrations of NO_2 can be very toxic, and even short exposure to high levels of NO_2 can cause inflammation of the lungs, possibly resulting in pulmonary edema and lung hemorrhaging. The only external sign of NO_2 poisoning is shortness of breath. Sufficient dilution by adequate quantities of air of all contaminants, and in particular of NO_2, during the entire period that diesel-powered equipment operates is therefore essential in protecting miners' health.

It is important to note that the approval plate calculation assumes total mixing of the exhaust gases in the ventilating air, and that levels of exhaust gases that are higher than the TLV®'s will likely occur close to the machine's exhaust, before the gases are fully dispersed and diluted by the ventilating air. Essentially, this means that the approval plate air quantity represents the best-case scenario for contaminant dilution. The approval plate air quantity is therefore the smallest amount of air that will ensure that contaminants are within acceptable levels at all points in the engine's duty cycle.

It should also be noted that the oxides of nitrogen (NO and NO_2) have been the controlling gases for engine approval plate quantities for the vast majority of diesel engines that have been approved in the past. This means the approval plate quantity is determined by the air needed to dilute those two gases; a lesser quantity of air is sufficient to dilute the other gaseous contaminants produced by the engine. Although NO does not have the same toxic effects as NO_2, it does convert to NO_2 over time. As mentioned above, sufficient dilution of NO_2 is essential to protect miners from its potentially severe effects.

The approval plate air quantity calculation takes into account the worst operating point of a properly maintained engine tested under laboratory conditions. Some commenters asserted that approval plate air quantities were unnecessarily high, because the quantities were calculated for the worst operating point of the machine, when the machine generated the highest levels of gaseous contaminants. Although commenters are correct in stating that the approval plate calculation represents the air quantity needed to dilute contaminants at the point where the engine produces the highest level of emissions, diesel engine emission levels are high over a range of operating points. See, Report of the Bureau of Mines, U.S. Department of the Interior, ''Relationship of Underground Diesel Engine Maintenance to Emissions'' (December 1983). Contrary to the assertions of some commenters, the engine approval plate quantity does not represent an unrealistically high quantity of air, but is an accurate determination, based on testing, of the ventilating air quantity needed to protect miners working in the vicinity of the equipment over their working shift. Finally, as pointed out by one commenter, the approval plate air quantity is calculated using new engines, whose performance will likely degrade to some extent over time, with the potential for increased emission levels, even if the engines are well maintained.

The performance-based approach advocated by several commenters could provide another method for determining minimum air quantities, but, for the reasons stated earlier, would substitute a rather intricate sampling process that would result in a determination that essentially the same minimum air quantities are needed to ventilate the equipment. Mandating approval plate quantities as the minimum air quantities is not the only approach to ventilation of diesel-powered equipment, but it is the most workable and practical.

The final rule does not adopt the suggestion of commenters who advocated factoring in exhaust after-treatment in determining minimum air quantities. The after-treatment technology currently available is ineffective in reducing the oxides of nitrogen. Consequently, the gases used to determine the approval plate air quantities for the vast majority of diesel engines that have been approved cannot be controlled by existing exhaust after-treatment technology. This recommendation has therefore not been adopted in the final rule.

The locations where minimum air quantities must be maintained for individual units of diesel equipment have been modified in the final rule from what would have been required under the proposal. The proposal would have required minimum air quantities for individual units of equipment to be maintained in any split of air where the equipment was being operated. A number of commenters disagreed with this provision, stating that the term ''split'' was vague and ambiguous, and did not adequately specify areas of the mine where individual units of equipment were likely to operate and generate high levels of diesel exhaust contaminants. Commenters also identified outby areas and section loading points as locations where diesel exhaust levels tended to be a particular problem and where additional ventilating air was needed. Several commenters stated that it was essential to have adequate ventilation across the mine's dumping points to ensure that diesel emissions are swept out of the area. These commenters stated that the rule should also address outby operation of diesel-powered equipment, because excessive diesel emissions occur in idled areas of the mine and during non-production times, when less air is typically required for ventilation because dangerous levels of methane tend to be less of a problem during those periods. Other commenters were of the opinion that the rule should not designate locations where minimum air quantities must be maintained, and supported determining these locations on a mine-by-mine basis.

In response to commenters, the final rule does not adopt the proposed requirement that the air quantity for individual units of equipment be maintained in any ''split'' where the equipment was being operated. Instead, paragraphs (f)(1) through (f)(5) list the specific locations where the minimum air quantity must be maintained, and include those locations identified by commenters where diesel equipment is typically inadequately ventilated and

where levels of exhaust contaminants are likely to be high. These locations include any working place where the equipment is being operated; at the section loading point during any shift the equipment is being operated on the working section; in any entry where equipment is being operated outby the section loading point in areas of the mine developed on or after the effective date of the final rule; in any air course with single or multiple entries where the equipment is being operated outby the section loading point in areas of the mine developed prior to the effective date of the final rule; and at any other location required by the district manager and specified in the approved ventilation plan.

Paragraph (f)(1) provides that the minimum ventilating air quantity for an individual unit of diesel-powered equipment must be maintained in any working place where the equipment is being operated. This responds to commenters' concerns and clarifies the intent of the proposal, which would have required that the minimum air quantity be maintained in the ''split'' where the equipment operates. As discussed above, a number of commenters did not consider the term ''split'' to be sufficiently descriptive, and the final rule has been revised in response. Under the final rule required air quantities must be maintained in the ''working place,'' which is defined in existing § 75.2 as ''The area of a coal mine inby the last open crosscut.'' This location is designed to address ventilation of an individual unit of diesel-powered equipment that is working at an inby location, near the face.

Paragraph (f)(2) adds the specific requirement that the minimum air quantity for an individual unit of equipment be maintained at the section loading point during any shift that the equipment is being operated on the working section. This provision responds to commenters who singled out loading points as one of the locations where excessive levels of diesel contaminants were a particular problem. Commenters pointed out that the ventilating air quantities at these locations were frequently insufficient to dilute exhaust contaminants and protect miners from unhealthful levels of exhaust gases. Because different types of equipment move in and out of a section loading point on a regular basis, the minimum required air quantity will be the greatest approval plate quantity among all of the diesel-powered equipment that is operated at the loading point during the shift. This will ensure that miners are protected from overexposure to contaminants at all times during the shift, regardless of which unit of diesel equipment is at the loading point.

Paragraphs (f)(3) and (f)(4) have been added to the final rule to address the concerns of those commenters who stated that minimum ventilation requirements should apply to diesel-powered equipment that is being operated in outby areas. These two provisions, one of which applies to areas of the mine developed before the effective date of the final rule and the other which applies to areas developed on or after the effective date, recognizes that the ventilation system design at some mines with multiple common haulage entries would make it difficult, if not impossible, to maintain minimum air quantities in a single entry. Consequently, the final rule allows the minimum air quantity to be maintained in the air course rather than in a single entry, in areas of the mine developed before the effective date of the final rule. In areas of the mine developed on or after the effective date, the minimum air quantity must be maintained in a single entry. This means that mines with multiple common entries that use diesel equipment must alter their approach to future mine development no later than the effective date of the final rule.

This two-pronged approach to ventilation of outby diesel equipment recognizes that the location and direction of required air quantities have an impact on how effectively the air will dilute diesel engine emissions. Air that is coursed directly over diesel equipment will dilute contaminants more effectively than air of the same volume and velocity that is dispersed over a wider area. Consequently, providing the air quantity in a single entry rather than over multiple entries is a more desirable method of ventilation. However, this approach also takes into account that a number of mines would be unable to comply with the location requirements of (f)(3) in areas that have already been developed, without significant capital expenditures and substantial disruption of mining operations. This aspect of the final rule therefore strikes a balance between the concerns of commenters regarding adequate ventilation of diesel equipment operated in outby areas, and the economic infeasibility of a complete overhaul of areas of the mine that have already been developed.

It should be noted that § 75.1907 of the final rule does not require diesel equipment used in outby areas to have an engine approved under subpart E of part 7 of the final rule until 3 years after the publication date of this rule. During this transitional period, equipment with unapproved engines that do not have an approval plate will not be subject to the minimum air quantity requirements of the final rule. However, mine operators are under a continuing obligation to ensure that air contaminants are maintained within the limits established in § 75.322, and diesel-powered equipment must be ventilated with sufficient quantities of air to prevent overexposure of miners.

Paragraph (f)(5) has been added to the final rule to give the district manager the authority to require other locations where minimum air quantities for individual units of equipment must be maintained. These locations must be specified in the ventilation plan. This provision has been added in response to commenters who were concerned about inadequate ventilation in areas where diesel-powered equipment was operating, other than those locations specified in paragraphs (f) (1) through (4). These locations could include, for example, underground repair shops, permanent fuel storage facilities or temporary fuel storage areas, or construction sites where diesel-powered equipment is regularly operated and where minimum air quantities are needed to keep contaminant levels within acceptable limits.

The final rule adopts the proposal's approach of using the engine approval plate air quantity to determine the minimum air quantity in areas where multiple units of diesel-powered equipment are being operated. Paragraph (g) provides that the minimum ventilating air quantity where multiple units of diesel-powered equipment are operated on working sections and in areas where mechanized mining equipment is being installed or removed, must be the sum of 100 percent of the approval plate quantities for all of the equipment. As mentioned earlier, this is a change from the 100–75–50 percent approach of the proposal.

The final rule, like the proposal, also specifies certain equipment that may be excluded from the calculation of minimum air quantity, and also permits a mine operator to obtain a reduction in the required minimum air quantity for multiple units if sampling evidence establishes that a lesser ventilating air quantity will maintain continuous compliance with the TLV'S in § 75.322.

Several commenters advocated that approval plate air quantities be used only as guidelines for ventilation of multiple units of equipment, for the same reasons outlined in the discussion of ventilating air quantities for individual units of equipment. These commenters stated that there were a

number of variables that must be considered in establishing ventilation for diesel equipment, and advocated determining minimum air quantities on a mine-by-mine basis.

Some commenters were opposed to the 100–75–50 approach, stating that it would not adequately protect miners. These commenters took issue with the assumption that multiple units of diesel-powered equipment could not be operating at their worst point, i.e., generating the highest levels of emissions—simultaneously. Commenters also pointed out that the 100–75–50 approach assumed that engines perform at a consistent level from the day they are purchased until the end of their useful life, and advocated that the sum of 100 percent of the approval plate air quantities be used instead as the minimum ventilation quantity.

The final rule, like the proposal, specifies that engine approval plate quantities are the minimum ventilating air quantity for diesel-powered equipment. The approval plate quantity is required for multiple units for the same reasons that it is required for individual units: it is an accurate calculation of the amount of air that is needed to dilute gaseous diesel exhaust contaminants to acceptable levels. However, the final rule, like the proposal, allows mine operators to seek reductions in the required air quantities if they are able to demonstrate that contaminant levels will be kept within required limits at reduced ventilating air levels. This provision recognizes that, as stated by commenters, there may be variables of mine design, equipment operation, or ventilation in areas where multiple units operate that may result in less air being needed to keep air quality within healthful limits. For example, if the diesel machines on a section are not operated so that all machines are producing maximum emissions simultaneously, reduced minimum air quantities may be appropriate.

The final rule does not adopt the 100–75–50 approach, in response to commenters' concerns that it would not provide adequate protection for miners, and for several other reasons. First, the 100–75–50 formula was designed to account for differences in duty cycles among the equipment, since the approval plate air quantity is based upon the worst point of the operating range of the equipment relative to gaseous emissions. The 100–75–50 approach assumed, as has been pointed out by commenters, that multiple units of equipment would not have been operating at their worst points at the same time. As discussed above, although the approval plate air quantity is calculated for a worst case engine operating point, research has shown that engines generate high levels of contaminants over a range of engine operating points. The air quantity available on the section should be sufficient to control the engine emissions under all conditions.

The 100–100–100 approach also recognizes that approval plate air quantities will be calculated differently under part 7 than they have been under part 36, prior to the promulgation of this final rule. As discussed in the preamble to subpart E of part 7, an engine's approval plate air quantity under the final rule will be determined by the amount of air needed to dilute contaminants to the TLV®'s in § 75.322. Up until now, approval plate quantities have been determined under part 36 based on the amount of air needed to dilute contaminants to 50 percent of the TLV®'s that were in effect when part 36 was first promulgated in 1961. Although the levels to which CO and NO_2 must be diluted remain the same under the final rule, the dilution levels for NO and CO_2 are twice as high. Consequently, less air will be needed to dilute these two gases to the higher levels, and the approval plate quantity will be lower for most if not all engines. However, the approval plate quantity will now directly correlate to existing TLV®'s. It follows that 100 percent of the approval plate quantity, rather than some fraction thereof, must be provided to adequately dilute the gaseous diesel engine contaminants.

Approval plate quantities determined under the final rule may also be slightly lower than before under old part 36, as a result of the revision in part 36 that requires engines to be tested with 1.0 percent methane injected into the engine air intake, rather than the current 1.5 percent. Because injection of methane into the engine increases engine emissions, the lower concentration of methane used under the final rule will result in lower emissions and will require a lower quantity of air to dilute.

Because of these factors, the 100–100–100 calculation for multiple units of equipment will not result in minimum air quantities that are significantly greater than air quantities currently required in ventilation plans using the 100–75–50 method of calculation. In fact, in some cases, the air quantity required for multiple units may be less than what was required before, depending on the diesel equipment that is being operated.

Under the proposal, air quantities in excess of the 100–75–50 calculation for multiple units of equipment would have been required when the particulate index established for the equipment indicated that a greater air quantity was needed to maintain diesel particulate levels within acceptable limits. The particulate index indicates the quantity of air required to dilute particulate emissions from that specific engine to a concentration of 1 milligram per cubic meter of air. The 1 milligram value was chosen to make the use of a diesel particulate permissible exposure limit with an engine's particulate index a matter of simple multiplication, and is not meant to be an indicator of the level of any diesel particulate standard that may be set by MSHA in the future.

Under the proposal, MSHA intended to apply the particulate index in two phases, before and after the setting of a diesel particulate standard. Before the promulgation of a standard, MSHA intended to take an engine's particulate index into account in approving minimum air quantities in a mine operator's ventilation plan by estimating the contribution of diesel particulate to the total respirable coal mine dust concentration. After the promulgation of a diesel particulate standard, the minimum air quantity would be determined using the particulate index to calculate the air quantity needed to dilute the particulate concentration to whatever level was required.

A number of commenters stated that, because MSHA has not yet established a permissible exposure limit for diesel particulate, a requirement for increased air quantities based upon a diesel particulate index was inappropriate. Other commenters supported the use of a particulate index as a point of comparison among different diesel-powered engines, but they were strongly opposed to the use of the index to require minimum air quantities. Other commenters stated that accurate measurement of diesel particulate is not possible, because diesel particulate matter is indistinguishable from other respirable coal mine dust. One commenter stated that the particulate index fails to take into account that the diesel engine is itself only one factor in how cleanly the machine operates as a whole. This commenter recommended that other factors be considered, including the effectiveness of water scrubbers, dilutors, catalytic convertors, and particulate traps or filters, any one of which could significantly reduce diesel particulate emissions.

Although MSHA is currently developing a proposed rule to control miners' exposure to diesel particulate, MSHA agrees with commenters who believe that the use of the particulate

index for determining minimum ventilation requirements would be premature in the absence of a standard for diesel particulate. The final rule therefore does not adopt the proposal's requirement for increased air quantities based on a diesel engine's particulate index. However, MSHA will still calculate an engine's particulate index as part of the approval process. As was true under the proposal, the particulate index will be determined under part 7 of the final rule. The particulate index for the engine will be reported in the approval letter that MSHA sends to the engine manufacturer notifying the manufacturer that the engine has been approved. A copy of this letter also accompanies the equipment when it is purchased by the mine operator. The particulate index for all MSHA-approved diesel engines will also be included on MSHA's list of approved products, which is issued on a regular basis to the individuals and companies on MSHA's mailing list. MSHA anticipates that, until a diesel particulate standard has been set, mine operators and machine manufacturers will use the engine particulate index in selecting and purchasing engines. During this time mine operators may also use an engine's particulate index to roughly estimate the engine's contribution to the mine's levels of total respirable coal mine dust.

Under the proposal multiple units of equipment would have been required to be ventilated by specified minimum air quantities in the last open crosscut of each working section or in the intake splits of longwall sections. The proposed rule would also have required minimum air quantities to be maintained when face equipment was being installed or removed.

One commenter stated that air on a dieselized section should be coursed throughout the section and should not be concentrated in the last open crosscut. This commenter recommended that the total intake air quantity going into the section intake and the total return air quantity leaving the section should be measured. Another commenter stated that air measurements are more accurate in the immediate return of each split, rather than at the last open crosscut.

Several commenters pointed out that too much air across the face area was detrimental to the effective operation of respirable dust scrubbers on continuous miners. Several commenters identified longwall moves as periods when miners were exposed to high levels of diesel exhaust, due to the increased use of diesel-powered equipment on the sections during these periods and the increased diesel engine loads. These commenters stated that during longwall moves the exhaust from one diesel machine would be ''rebreathed'' by another diesel machine, resulting in a doubling of carbon monoxide levels.

Paragraphs (g)(1) through (g)(3) of the final rule set forth the specific locations where minimum air quantities must be maintained where multiple units of diesel-powered equipment are operating. Under the proposal, as described above, minimum air quantities would have been required in the last open crosscut of each working section or in the intake splits of longwall sections.

The final rule essentially adopts the approach of the proposal, although the term ''split'' used in the proposal has not been adopted in the final rule because, as explained in the discussion under paragraph (a) of this section, commenters considered the term ''split'' to be vague and ambiguous. The final rule provides more specific description of the locations where air quantities must be maintained, although the location requirements themselves are essentially the same as they would have been under the proposal. Paragraphs (g)(1) through (g)(3) of this section require the minimum air quantity in working sections to be maintained: in the last open crosscut of each set of entries or rooms in each working section; in the intake, reaching the working face of each longwall; and at the intake end of any pillar line.

The final rule does not adopt the suggestion of commenters that air measurements be taken at locations other than those specified in the proposal. The recommendation that the total intake air quantity entering a section and the total return air quantity leaving a section be measured has not been adopted because this method of measurement will not provide an indication of the air quantity that is actually reaching the working section. The air could be short-circuited before it reaches the diesel machine, but still be measured as part of the return air quantity. Further, the recommendation that air measurements be taken in the immediate return of each split, rather than at the last open crosscut, has not been incorporated into the final rule because measurement at that location will give a less accurate indication of the air that is actually ventilating the diesel equipment. Finally, the measurement of air quantities at the last open crosscut under the final rule is also consistent with air measurement requirements currently in most underground coal mine ventilation plans.

The final rule does not respond to commenters who stated that too much air across the face area could have a negative impact on the effectiveness of respirable dust scrubbers on continuous miners. While it is true that increased air quantities could in some cases have an adverse effect on dust scrubber effectiveness, this impact must be balanced against the need to control harmful diesel exhaust contaminants. There are other dust control technologies that are available to supplement dust scrubbers if the need arises.

In response to the many commenters who expressed concern about exposure of miners to high levels of diesel exhaust contaminants during installation or removal of longwall equipment, the final rule adopts the proposed requirement that minimum air quantities be maintained in areas where mechanized equipment is being installed or removed.

Paragraphs (h)(1) through (h)(4) of this section of the final rule, like the proposal, allow certain types of equipment to be excluded from the minimum air quantity calculation of paragraph (g). The rationale behind these exclusions is that the specified equipment is operated or ventilated in such a way that it does not significantly affect the exposure of miners to diesel exhaust contaminants. Commenters were generally in favor of allowing certain equipment to be excluded, such as equipment with light-duty cycles or equipment that is only used intermittently. One commenter stated, however, that MSHA should verify information submitted by the operator to support exclusion of equipment, and that the final rule should require mine operators to notify miners or their representatives to allow them to comment on the operator's request for exclusion of equipment from the air quantity calculation.

In response to this comment the final rule, unlike the proposal, requires district manager approval of all exclusions and requires the exclusions to be specified in the ventilation plan. This will allow MSHA review of all equipment that will be excluded from the air quantity calculation, and responds to commenter concerns about MSHA verification of excluded equipment. Additionally, requiring excluded equipment to be specified in the ventilation plan will ensure that miners and their representatives, who are required under existing regulations to be provided with proposed revisions to an operator's ventilation plan, are notified of an operator's intention to exclude certain equipment. This

responds to commenters who advocated that miners' representatives be notified of and be given an opportunity to comment on such matters.

Paragraph (h)(1) allows the exclusion of self-propelled equipment meeting the requirements of § 75.1908(b) of the final rule. The proposal would have allowed the exclusion of the limited class of equipment meeting the requirements of proposed § 75.1908, except diesel-powered air compressors that are regularly used. The requirements of proposed § 75.1908 included specific objective criteria limiting equipment horsepower and weight. In response to commenters and for reasons explained in detail in the preamble to § 75.1908, equipment categories are defined in the final rule by the equipment function rather than by weight or horsepower. Equipment that meets the requirements of § 75.1908(b) is light-duty equipment that does not, among other things, cut or move rock or coal or move longwall components. Because the equipment is not operated under heavy load, it is not expected to produce high levels of exhaust emissions, and may therefore be excluded if specified in the mine operator's approved ventilation plan. Although the proposal did not explicitly limit the exclusion to self-propelled equipment, as does the final rule, the only portable equipment included in the proposed limited class was compressors and welders, and compressors were not eligible for exclusion under the proposal if they were regularly operated. The final rule takes a different approach and only includes self-propelled light-duty equipment in the automatic exclusion under paragraph (h)(1), because some types of non-self-propelled light-duty equipment, such as compressors and generators, can produce high levels of exhaust emissions. However, light-duty equipment that is not self-propelled whose emissions would not significantly affect the exposure of miners may be excluded from the air quantity calculation if approved by the district manager under paragraph (h)(4).

Also eligible for exclusion, under paragraphs (h)(2) and (h)(3), is equipment that discharges its exhaust into an intake air course that is vented directly into a return air course, or that discharges its exhaust directly into a return air course. Paragraph (h)(3), which exempts equipment vented directly into a return air course, has been adopted without change from the proposal. Paragraph (h)(2), which exempts equipment that discharges its exhaust into intake air that is coursed directly to a return air course, has been added to the final rule to be consistent with other MSHA regulations, which require certain equipment, such as electrical equipment, to be vented either directly into a return air course or into an intake air course that is coursed directly into a return air course. The rationale for both of these exceptions in the final rule is the same: that the diesel exhaust of equipment that discharges into a return air course or into an intake air course that goes directly into a return air course will not, in most cases, come into contact with miners because most of them will be working in intake air in the face area where production occurs. Commenters did not indicate any opposition to the reasoning behind these exceptions.

Paragraph (h)(4), like the proposal, allows mine operators to obtain MSHA approval for the exclusion of other equipment from the air quantity calculation in paragraph (g). Equipment may be excluded under this paragraph if its duty cycle is such that the emissions would not significantly affect the exposure of miners. Mine operators who seek to exclude equipment must identify the equipment in the ventilation plan that is submitted to MSHA for approval. Equipment that may be eligible for exclusion under paragraph (h)(4) includes equipment with a very small engine (less than 10 horsepower) or heavy-duty equipment that is operated infrequently, for very short periods of time, or when other diesel equipment normally operated on the section is shut down or not operating. An example of equipment that could be considered for exclusion under this paragraph is a supply vehicle that is driven up to the section, shut down and unloaded, started up and immediately driven off of the section. Equipment that is operated in a location so that its exhaust does not pass over miners could also be eligible for this exclusion. All other equipment, such as nonpermissible heavy-duty equipment and face equipment which discharges its exhaust into an intake air course of the working section, must be included in the minimum air quantity calculation required by paragraph (g).

Paragraph (i) of the final rule, like the proposal, allows the district manager to approve a lesser air quantity than what would otherwise be required under paragraph (g) for multiple units of diesel equipment. The final rule allows such a modification if sampling results demonstrate that miners exposure to diesel contaminants will not exceed applicable TLV®'s at the modified ventilation quantity.

The proposed rule would have allowed the district manager to approve lesser air quantities for multiple units of equipment if the results of a comprehensive personal monitoring program indicated that contaminant exposure levels were below 75 percent of the applicable contaminant standards with 95 percent confidence. The proposed rule also specified the information that mine operators would have been required to submit to MSHA for consideration in reducing minimum air quantities, including the actual sampling plan and an evaluation of the sampling results.

Some commenters were opposed to requiring a 95 percent confidence level for the sampling used to support a reduction in air quantity, stating that this requirement was too technical and unrealistic for practical application. Some commenters strongly opposed allowing reduction of air quantities under the procedure set forth in the proposal, stating that miners and their representatives would not be given sufficient opportunity to participate in the process. One commenter advocated use of petition for modification procedures under section 101(c) of the Federal Mine Safety and Health Act when mine operators seek to revise their ventilation plans, stating that under these procedures miners and miners' representatives would have the right to review and comment on the proposed plan modifications.

The final rule takes a more performance-oriented approach to reduction in minimum air quantities, and requires that samples of contaminants demonstrate that a lesser air quantity will maintain contaminant levels within permissible limits. This is consistent with the streamlined procedures for contaminant sampling in § 70.1900 of the final rule, and also responds to commenters' recommendations that this aspect of the rule should be less technical.

The objective of this aspect of the final rule is the same as that of the proposal: that reduction of minimum air quantities required by the final rule is permitted if a mine operator can establish that miners will not be overexposed to gaseous diesel exhaust contaminants at the lesser ventilating air quantities.

The final rule does not adopt the suggestion of commenters that reductions in air quantity be granted only under the modification procedures of section 101(c) of the Mine Act. Since the time of the submission of these comments, MSHA has issued a final rule governing underground coal mine ventilation, which includes revisions to the existing ventilation plan submission and approval process [61 FR 9764] and addresses several of these commenters' concerns. The revised ventilation rules

provide an increased role for the representative of miners in the ventilation plan approval process. Mine operators are now required to notify the representative of miners at least 5 days before a ventilation plan or plan revision is submitted to MSHA for approval, and make a copy of the proposed plan or plan revision available for inspection to the miners' representative. The representative of miners is given the opportunity to submit written comments to MSHA for consideration during the plan review process. Under this process, operators seeking reduction in the minimum air quantities required under paragraph (g) are required to notify miners' representatives, who then have the opportunity to comment on the reduction. No provisions have therefore been made to address these comments in the final rule, because the comments have already been addressed appropriately in the revised ventilation rule.

Paragraph (j) allows modification of the 50 percent action level specified in § 70.1900(c) if sampling results demonstrate that miners will not be exposed to contaminants that exceed permissible limits at the modified action level. As described in detail in the preamble discussion for § 70.1900, any change to the action level must be based on the results of sampling that demonstrate that miners' personal exposure will not exceed the applicable TLV®.

Paragraph (k) provides that, as of 12 months after the publication date of the final rule, the ventilating air quantity required where diesel-powered equipment is operated shall meet the requirements of paragraphs (f) through (j) of this section. Compliance with the ventilation requirements of the final rule will in some cases require modifications to the mine's ventilation system. These revisions, along with other information required to be specified in the mine ventilation plan under paragraphs (f) through (j) of this section, should be included in a revised ventilation plan submitted to MSHA for review and approval.

Section 75.371 Mine Ventilation Plan; Contents

The requirements for diesel-powered equipment that are included by the final rule in existing § 75.325 identify information that must be specified in the mine operator's ventilation plan. Existing § 75.371, which lists the information that must be provided by mine operators in their mine ventilation plans, is amended by the final rule to conform to the new requirements in § 75.325.

As was true under the proposal, minimum air quantities for individual units of diesel-powered equipment are not required to be included in the ventilation plan, because individual units are required to be ventilated with at least the engine approval plate air quantity while they are operating. The final rule does require that the ventilation plan specify where air quantity will be maintained at the section loading point for individual units of equipment, as well as any additional locations required by the district manager where a minimum air quantity must be maintained for an individual unit of equipment.

The final rule, like the proposal, requires the ventilation plan to specify ventilation quantities for multiple units of equipment, as well as to include a description of equipment that is excluded from the multiple unit calculation of § 75.325(g).

Existing § 75.371(r) is revised by the final rule to include a cross-reference to § 75.325 (d), (g), and (i). Paragraph (r) requires the ventilation plan to identify the minimum quantity and the location of air that will be provided during the installation and removal of mechanized mining equipment, as well as the ventilation controls that will be used. The addition of a cross-reference to § 75.325 clarifies that minimum air quantity requirements for diesel-powered equipment must be considered when determining ventilation quantities during mechanized equipment installation and removal.

New paragraph (kk) has been added to § 75.371 and provides that the ventilation plan shall include any additional areas designated by the district manager under § 70.1900(a)(4) of the final rule for CO and NO_2 sampling. As explained in more detail in the preamble to § 70.1900, the district manager is authorized under the final rule to require sampling in strategic locations on a mine-by-mine basis, in order to address situations involving significant concentrations of diesel exhaust. Paragraph (kk) conforms the content requirements for ventilation plans to this new provision.

New paragraph (ll) provides that the ventilation plan must specify the location where the air quantity will be maintained at the section loading point.

New paragraph (mm) provides that the ventilation plan include any additional locations required by the district manager, under § 75.325(f)(5), where a minimum air quantity must be maintained for an individual unit of diesel-powered equipment.

New paragraph (nn) provides that the ventilation plan must specify the minimum air quantities that will be provided where multiple units of diesel-powered equipment are operated. To comply with this requirement, mine operators should indicate the equipment that is being used in the normal mining cycle, and the minimum air quantities that must be provided to ventilate the specified equipment.

New paragraph (oo) provides that the ventilation plan must specify the diesel-powered equipment excluded from the calculation under § 75.325(g). MSHA does not intend that this provision require the itemization or the serial numbers of specific equipment. Instead, the mine operator should provide a general description that is sufficient to identify the types of equipment that are excluded from the calculation.

New paragraph (pp) conforms ventilation plan content requirements to §§ 70.1900(c) and 75.325(j), and provides that the ventilation plan shall identify any action levels that are higher than the 50 percent level specified by § 70.1900(c). As described in greater detail in the preamble discussion of § 70.1900, mine operators may obtain a higher action level if they are able to demonstrate that miners will not be overexposed to contaminants at the higher level. If a higher action level is approved by the district manager under § 75.325(j), it must be specified in the mine ventilation plan.

Section 75.1900 Definitions

This section of the final rule contains definitions of terms used in subpart T of part 75. These definitions are provided to assist the mining community in understanding and complying with the requirements of the final rule. As a general matter, terms which are unique to the final rule are defined, while those terms that are commonly used and understood in the mining industry have not been included for definition.

The proposed rule defined two terms: ''fixed underground diesel fuel storage facility'' and ''mobile underground diesel fuel storage facility''. The final rule adopts the proposed definition for ''fixed underground diesel fuel storage facility'', although the term itself has been slightly modified, with the substitution of the word ''permanent'' for the word ''fixed'' to more accurately reflect the nature of the facility. A ''permanent underground diesel fuel storage facility'' is defined as a facility designed and constructed to remain at one location for the storage and dispensing of diesel fuel, and which does not move as mining progresses. Such facilities are designed to remain at

one location for an extended period of time. Additionally, the final rule also adopts, with slight modification, the proposed definition for ''mobile underground diesel fuel storage facility'', although that term has been changed in the final rule to ''temporary underground diesel fuel storage area'' to be more accurately descriptive. A ''temporary underground diesel fuel storage area'' is defined as an area of the mine provided for the short-term storage of diesel fuel in a fuel transportation unit, which moves as mining progresses.

The final rule also includes additional definitions for the terms ''diesel fuel tank'', ''diesel fuel transportation unit'', ''noncombustible material'', and ''safety can''.

Several commenters believed that the definitions in the proposal were too narrow in scope and did not accurately reflect the different fuel storage facilities currently in use in underground coal mines or the different applications of mobile diesel-powered equipment. These commenters recommended the definition of two additional categories of underground diesel fuel storage facilities: ''temporary'' and ''self-propelled.'' Commenters offered definitions for these two additional types of facilities, but they have not been adopted in the final rule, although, as mentioned above, the word ''temporary'' has been substituted for the word ''mobile'' in describing areas provided for short-term fuel storage that move as mining progresses. The suggested definition for ''self-propelled diesel fuel storage facility'' has not been included because it is similar in function and definition to a ''diesel fuel transportation unit,'' which has been defined in the final rule.

The definition offered by commenters for ''temporary diesel fuel storage facility'' reflected commenters' concerns that the proposed construction requirements for mobile fuel storage facilities were too extensive, and would make it difficult for the facility to move with the section and keep pace as mining progressed. Commenters therefore recommended the creation of a category of fuel storage facility with more flexibility than the mobile storage facilities under the proposal.

In response to these comments, requirements for temporary fuel storage are addressed separately from those for permanent facilities in the final rule, and reflect a more practical approach to temporary fuel storage, which is explained in detail in the discussion of § 75.1903, below. A definition for ''temporary fuel storage facility'' is consequently unnecessary and has therefore not been adopted in the final rule.

One commenter recommended that several other terms be defined in the final rule, including ''container,'' ''safety can,'' ''tank,'' and ''fuel transportation unit.'' This commenter pointed out that these terms are used throughout subpart T, and definition of these terms would enhance understanding of the requirements of the final rule.

MSHA agrees that definition of certain terms will facilitate compliance with the requirements of subpart T, and has therefore included definitions for ''diesel fuel tank,'' ''diesel fuel transportation unit,'' ''noncombustible material,'' and ''safety can.'' Because the term ''fuel storage container'' is not used in the final rule, a definition for this term is not included in the final rule.

The term ''diesel fuel tank'' is defined in the final rule as a closed metal vessel specifically designed for the storage or transport of diesel fuel. Metal tanks are required based on metal's demonstrated ability to contain diesel fuel in the event of a fire, documented by the Bureau of Mines in a 1985 Report of Investigation entitled ''Fire Tests of Five-Gallon Containers Used for Storage in Underground Coal Mines'' (RI 8946). This type of construction is also consistent with the National Fire Protection Association (NFPA) ''Standards for Portable Shipping Tanks for Flammable and Combustible Liquids'', (NFPA 386).

The term ''diesel fuel transportation unit'' is defined as a self-propelled or portable, wheeled vehicle used to transport a diesel fuel tank. This definition includes diesel-powered vehicles such as lube units, maintenance trucks, tractors, and scoops. This definition also includes locomotives that pull rail-mounted, portable diesel fuel transportation units. Under the final rule fuel transportation units must be wheel-mounted, since skid-mounted units are more likely to be damaged during loading and unloading in a scoop bucket or while being dragged through the mine. Required safety features for these units are contained in § 75.1902 and §§ 75.1904 through 75.1906 of the final rule. Additionally, self-propelled fuel transportation units that are diesel-powered, and diesel-powered equipment used to tow portable fuel transportation units are considered heavy-duty equipment under § 75.1908(a). Heavy-duty equipment must be provided with the safety features specified in § 75.1909, including an automatic fire suppression system and additional specifications for the equipment's braking system.

Under the final rule, permanent underground diesel fuel storage facilities must be constructed of ''noncombustible materials,'' and stationary tanks in those facilities must be placed on 12-inch supports constructed of ''noncombustible material.'' ''Noncombustible material'' is defined in the final rule as a material that will continue to serve its intended function for 1 hour when subjected to a fire test incorporating an ASTM E119–88 time/temperature heat input, or equivalent. This test, contained in the publication ''Standard Test Methods for Fire Tests of Building Construction and Materials'' of the American Society for Testing and Materials, is used to establish fire resistance ratings in minutes or hours for a particular building assembly such as a roof, wall, or beam. This means that a material maintains its integrity under a fire exposure test used by the building industry to classify assemblies for their ability to resist fire. This definition is consistent with the definition of ''noncombustible material'' in existing § 75.301, which applies to the construction of ventilation controls in underground coal mines.

One commenter who recommended that ''noncombustible material'' be defined in the final rule suggested that the definition specify a 2-hour fire rating. The definition in the final rule specifies a 1-hour rating, which will provide protection in the event of a fire in underground fuel storage areas by confining the fire within the area for a sufficient period of time to allow miners to safely evacuate the mine. Additionally, the final rule requires automatic fire suppression systems and audible and visual alarms for permanent underground fuel storage facilities. For these reasons, adequate protection of miners against fire is provided, and a 2-hour fire rating has not been adopted in the final rule.

The term ''safety can'' is defined in the final rule as a metal container with a nominal capacity of no more than 5 gallons used for storage, transport, or dispensing of diesel fuel that is listed or approved by a nationally recognized independent testing laboratory. Commenters supported the use of approved safety cans to transport small amounts of diesel fuel. This definition provides assurance that adequate construction and performance specifications for fire protection are met. The limitation on the capacity of safety cans to no more than 5 gallons will control the amount of diesel fuel being transported and minimize potential fuel

spillage. Such specifications and limitations are necessary in light of accident reports of 10 fires in Canadian mines that resulted from diesel fuel spillage during refueling.

A safety can that meets this definition could be listed by Underwriters Laboratories or approved by Factory Mutual, Inc. Some nationally recognized independent testing laboratories have established specific construction specifications for the type and thickness of materials; material strength, stability and resistance to leakage; and standards for fire exposure that ensure that the can will safely vent if exposed to a heat source such as a fire.

The final rule defines ''safety can'' as a metal container. Thus, a plastic safety can listed or approved by a nationally recognized independent testing laboratory would not be acceptable under the final rule. A metal container is specified because metal is superior to plastic in containing diesel fuel in the event of a fire. The safety advantage provided by metal cans has been documented in the 1985 Bureau of Mines' Report cited earlier. Specific design requirements for safety cans are addressed in § 75.1904 of the final rule.

Section 75.1901 Diesel Fuel Requirements

This section of the final rule establishes specifications for the fuel used in diesel-powered equipment in underground coal mines. Satisfying the requirements of this section will lower diesel engine gaseous and particulate emissions, and will reduce equipment maintenance by limiting the amount of sulfur in the fuel. The risk of fire in underground coal mines is also reduced by the minimum flash point for the fuel required by the final rule. The safety benefits that result from this aspect of the final rule are particularly important in the confined environment of an underground coal mine.

Paragraph (a) of this section requires that diesel fuel used in underground coal mines contain no greater than 0.05 percent sulfur and have a flash point of 100° F (38° C) or greater. The final rule also requires the mine operator to provide an authorized representative of the Secretary, upon request, with evidence that the diesel fuel purchased for use in diesel-powered equipment underground meets these requirements.

The proposed rule would have required ASTM D975 No. 2D diesel fuel, with a flash point of 125° F or greater, at standard temperature and pressure. Many commenters objected to the requirement for ASTM D975 No. 2D diesel fuel, stating that the reference to No. 2D fuel was a manufacturing classification, did not describe a type of diesel fuel that was commercially available, and would unnecessarily limit the use of diesel fuel in underground coal mines.

MSHA agrees with commenters that the proposed fuel specifications do not describe a fuel that is commercially available, and the fuel specifications contained in the final rule respond to these comments. The reference to ASTM D975 No. 2D diesel fuel has been eliminated, and a minimum flash point and maximum sulfur content for diesel fuel have been specified. The fuel described by the final rule is in widespread use throughout the United States, and is easily obtained by mine operators. The fuel specifications in the final rule are based on Environmental Protection Agency on-highway fuel requirements for commercially available diesel fuel.

A number of commenters were concerned that the required flash point of diesel fuel not be set too low, stating that any diesel fuel specifications must keep the fuel within the class of combustible liquids, ensuring that hazards associated with diesel fuel are no greater than those associated with other combustible liquids used underground. Some of these commenters recommended that the flash point for diesel fuel be set at 140° F, stating that lower flash points would increase the risk of vaporization and increased aromatic content, especially at warmer mine temperatures. These commenters stated that increased aromatic content has an effect on particulate emissions.

Other commenters stated that the proposed flash point of 125° F was too high. Some commenters reported that the flash point of diesel fuel is intentionally lowered when fuel suppliers mix it for a winter blend, to depress the cloud point of the diesel fuel and reduce the temperature at which the fuel begins to jell. These commenters believed that a flash point of 125° F would virtually eliminate their ability to use diesel-powered equipment in cold temperatures, unless the rule specifically allowed the use of winter blends of diesel fuel with flash points below 125° F. These commenters pointed out that the ASTM 975 specification for diesel fuel is being changed to lower the minimum flash point of D1 diesel fuel to 100° F (38° C) when the cloud point is lower than 10° F, and that a reduction of the flash point in the final rule was appropriate.

Another commenter believed that the diesel fuel autoignition point does not change in the lower range of flash point for diesel-powered equipment, concluding that the safety of diesel fuel exposed to hot surfaces would not change with changing flash points.

No demonstrated hazard exists to justify raising the flash point of diesel fuel above the proposed flash point of 125° F. However, MSHA acknowledges commenters' concerns that the proposed flash point may unintentionally limit the use of diesel fuel during the winter. To address this issue, the flash point has been lowered in the final rule to 100° F (38° C) or greater.

Several commenters suggested that the terms ''flash point'' and ''combustible liquid'' be defined, with some commenters offering recommended language for the definitions. The final rule does not include definitions for these terms. The term ''flash point'' is commonly understood in the mining industry to mean the lowest temperature at which a liquid will give off sufficient vapor to ignite on application of a flame, and does not need to be defined in this rule. The suggested definition offered by commenters for the term ''combustible liquid'' specifies a flash point temperature. Because the final rule sets a minimum flash point temperature for diesel fuel, such a definition is unnecessary.

The proposal did not set a limit on sulfur content for diesel fuel, but would have required sampling for sulfur dioxide when diesel fuel was used that contained more than 0.25 percent sulfur. This approach was taken because, although the proposal recognized that use of low sulfur fuel was desirable, it was not readily available nationwide at the time the proposal was published in October 1989.

Some commenters stated that the sulfur content of diesel fuel should be limited in all cases to 0.25 percent. Others stated that a sulfur content requirement should be phased in, ultimately reaching the Environmental Protection Agency's maximum sulfur level of 0.05 percent. One commenter stated that a requirement for low sulfur fuel would provide a health benefit to miners by reducing particulate emissions.

MSHA agrees that the sulfur content of diesel fuel should be kept at a low level. Sulfur in diesel fuel contributes to diesel particulate emissions. Additionally, some types of exhaust after-treatment technology designed to lower hazardous diesel emissions work better when the sulfur content in the fuel is low. More effective strategies for after-treatment technology will result in reduced hydrocarbons and carbon monoxide levels. Low sulfur fuel also

greatly reduces the sulfate production from the catalytic converters currently in use in underground coal mines, thereby decreasing exhaust pollutants. Today, low sulfur fuel is readily available and widely used by on-road commercial vehicles. For these reasons, the final rule requires that diesel fuel contain no greater than 0.05 percent sulfur, which fuel is readily available nationwide.

Under § 70.1900 of the proposal, mine operators would have been required to provide MSHA with a certified statement if the sulfur content of the fuel used in their diesel equipment was 0.25 percent or less. This provision was included with exposure monitoring requirements because use of high sulfur fuel under the proposed rule would have triggered weekly area sampling requirements. Specifications for diesel fuel are now addressed in paragraph (a) of this section of the final rule, and the operator's obligation to verify the fuel's sulfur content has also been included in this section.

The final rule requires the mine operator to provide to an authorized representative of the Secretary, upon request, evidence that the diesel fuel purchased for use in diesel-powered equipment underground meets the requirements of paragraph (a). This will not be a burdensome requirement. MSHA anticipates that the mine operator's contract with the mine's fuel supplier will document the type of fuel that is being purchased. The verification required under this paragraph may also be provided by a copy of a fuel analysis, which can be performed by a supplier's quality control laboratory or a private laboratory at minimal or no cost to the operator. MSHA recognizes that purchase orders and invoices may be kept at a mine's administrative office rather than at the mine site. Although the final rule does not specify a location or manner of recordkeeping for the document evidencing diesel fuel content, the mine operator may choose to keep an additional copy of the document to be easily accessible to a representative of the Secretary. A small recordkeeping burden is estimated for this requirement under the Paperwork Reduction Act of 1995.

Paragraphs (b) and (c) of this section of the final rule address additives for diesel fuel used in diesel-powered equipment in underground coal mines. The requirements of these two paragraphs were not part of the proposal but have been added to the final rule in response to commenters' concerns over the types of substances that could be safely added to diesel fuel.

Paragraph (b) prohibits the addition of flammable liquids to diesel fuel. One commenter expressed concern that the proposed rule would not prohibit flammable liquids, such as gasoline, from being mixed with diesel fuel underground to assist in machine starting and operation during cold weather. Because gasoline is highly flammable, adding it to diesel fuel could cause the flash point of the fuel to drop below 100° F (38° C) and transform the fuel into a flammable liquid. Further, use of gasoline as a diesel fuel additive could ruin an engine's fuel system by reducing the lubricating properties of the fuel. In response to these concerns, the final rule prohibits the addition of flammable liquids, such as gasoline, to diesel fuel. This restriction will promote the safe use of diesel fuel underground.

Kerosene, on the other hand, is commonly used as a cutter stock for lowering the cloud point in diesel fuel. Because kerosene has a flash point above 100° F (38° C) it is classified as a combustible rather than a flammable liquid and therefore may be added to diesel fuel under the final rule.

Paragraph (c) permits only diesel fuel additives that have been registered with the Environmental Protection Agency (EPA) under 40 CFR Part 79 [59 FR 33042] to be used in diesel-powered equipment underground. Because the proposed rule was silent on whether the use of diesel fuel additives would be permitted, a number of commenters raised additives as an issue and advocated that the final rule permit them to be used. These commenters stated that additives served to depress the cloud point of diesel fuel during cold weather to prevent jelling of the fuel. A cloud point depressant works by breaking down larger size crystals to smaller crystals, thus allowing the fuel to flow more freely. Several commenters expressed concern about the effect additives may have on diesel exhaust particulate emissions when mixed with diesel fuel. Other commenters wanted to be permitted to use additives, such as barium additives, with diesel fuel used to power equipment underground. One commenter stated that MSHA should encourage further research on the use of additives.

The wide variety of diesel fuel additives currently on the market makes control of the use of these additives difficult. The final rule addresses this issue by limiting fuel additives used underground to those registered under specific EPA regulations.

EPA regulations at 40 CFR Part 79 forbid manufacturers from placing any fuel additive into commerce unless the additive has been registered with the EPA Administrator. The EPA registration process requires the submission of extensive test data for specific health effect endpoints, as well as a general systemic and organ toxicity literature search on the health and welfare effects of the fuel additive emissions, including the characteristics of the emissions. Registered fuel additives are maintained by the EPA on a list that is available to the public.

The requirements of this paragraph do not place an undue burden on mine operators, because operators need only verify with their fuel supplier or distributer that the additive purchased is included on the EPA registration list.

Section 75.1902 Underground Diesel Fuel Storage—General Requirements

This section of the final rule provides general requirements for the safe storage of diesel fuel underground. These requirements are intended to minimize risks associated with fire hazards in the areas where diesel fuel is stored. This section limits the receptacles that may be used for diesel fuel storage underground to diesel fuel tanks and safety cans; allows only one diesel fuel transportation unit in a temporary fuel storage area; places a 1000-gallon limit on the capacity of stationary diesel fuel tanks in permanent fuel storage facilities; and limits the location of permanent fuel storage facilities and temporary fuel storage areas underground.

A number of commenters were concerned about the additional hazards that would be created by the storage of a combustible—diesel fuel—in underground coal mines. Some commenters opposed any type of fuel storage underground, while others believed that diesel fuel can be safely stored. Those commenters who opposed the storage of diesel fuel underground stated that it would present numerous safety hazards, including an increase in the probability of the fuel becoming involved in a mine fire and cutting off the avenue of escape for miners. These commenters recommended that language in existing MSHA regulations at § 31.9 (c)(2) and (c)(3) be incorporated in the final rule. These regulations address refueling of diesel locomotives underground and provide that, whenever possible, locomotive fuel tanks be filled on the surface; contain specific requirements when locomotives are refueled underground; and prohibit underground fuel storage.

Commenters opposed to allowing storage of diesel fuel underground suggested that mine operators could file a petition for modification under Section 101(c) of the Mine Act if they

had a compelling need to store diesel fuel underground. These commenters felt that a case-by-case approach would more effectively address hazards associated with diesel fuel storage.

Commenters were also concerned with maintenance and upkeep of diesel fuel areas. These commenters stated that fuel spills and hose leakage could possibly contribute to fire hazards. Commenters expressed reservations about storage, transport, and dispensing of diesel fuel from 5-gallon cans, particularly during refueling, stating that temporary storage should not be allowed. These commenters wanted assurance that if diesel fuel storage were allowed underground, protections such as fireproof enclosures and pumps and other provisions that address fuel spillage would be provided.

Some commenters suggested that diesel fuel storage should be allowed only if it is tightly controlled, and that fuel spills must not be tolerated in areas of the mine that cannot be cleaned. A number of commenters recommended setting limits on the maximum quantity of fuel allowed on a production section, ranging from a 24- to a 48-hour supply. Other commenters supported permitting diesel fuel storage underground, but raised a number of issues related to fuel storage, such as appropriate construction requirements for underground facilities; fire protection; and the logistics of transporting and dispensing fuel in an underground environment. One commenter cited years of positive industry experience with safe underground storage and transport of diesel fuel. He stated that his own experience in safely operating an underground coal mine, including diesel fuel delivery, storage, transport and transfer, countered the proposition that proliferation of diesel fuel storage facilities would occur in an uncontrolled manner, resulting in unlimited quantities of diesel fuel being stored in underground mines.

MSHA has carefully reviewed all of the comments in determining how to address the storage of diesel fuel underground. Both MSHA and industry experience demonstrate that diesel fuel can be safely stored underground in limited quantities under controlled conditions. Allowing limited storage on the section will minimize other safety concerns cited by commenters, such as fuel leaks and spills. Underground fuel storage will also eliminate the need for frequent fuel trips, thus reducing hazards that are inherent in the transportation of diesel fuel. MSHA does not believe that it is useful or practical to restrict diesel fuel quantities based on projected use. The final rule instead sets specific gallon limits on the capacity of underground fuel storage tanks.

The final rule establishes safety requirements, including design and performance specifications for storage tanks, transportation vehicles, and cans for fuel storage; a limitation on the number of fuel storage units that may be parked on a section; and a limitation on the capacity of underground fuel storage facilities. MSHA believes that these requirements will provide a significant measure of additional protection from the hazards associated with the storage and handling of diesel fuel, and permit efficient and safe transportation and refueling of diesel equipment in underground coal mines. Under the final rule, miners are afforded protections that are equal to or greater than the protections of existing standards.

Paragraph (a) of this section provides that diesel fuel shall be stored in: (1) Diesel fuel tanks in permanent underground diesel fuel storage facilities; (2) diesel fuel tanks on diesel fuel transportation units in permanent diesel fuel storage facilities or temporary diesel fuel storage areas; or (3) safety cans. The proposal did not explicitly limit fuel storage underground to tanks and safety cans, and would have required that diesel fuel be transported in containers specifically designed for the transport of diesel fuel.

MSHA recognizes that large quantities of diesel fuel must be used in some mines. However, to protect against fires, spills, and other hazards, large quantities can only be stored in permanent facilities under this final rule.

The final rule permits fuel storage in tanks on fuel transportation units, but only under certain conditions and in limited quantities spelled out in other requirements in this section. A number of commenters recommended that the rule accommodate the need for fuel supplies to move as the production section moves. Other commenters expressed concerns that multiple mobile storage tanks might be located on the section at the same time, exposing miners to hazards, particularly from fire. The final rule also allows diesel fuel to be stored in safety cans.

The restrictions contained in paragraph (a) respond to commenters' concerns that storage of diesel fuel underground would lead to prolific, uncontrolled storage practices, and strictly limit the locations and receptacles for diesel fuel storage.

Paragraph (b) of this section limits the capacity of stationary diesel fuel tanks in permanent underground fuel storage facilities to 1,000 gallons. It is important to note that, while the total capacity of the fixed tanks is set, there is no limit on the number of stationary tanks that may be located in the facility. This means that the 1,000 gallons may be stored, for example, in two 500-gallon tanks or four 250-gallon tanks.

Like the final rule, the proposal prohibited storage of more than 1,000 gallons of diesel fuel in a permanent facility. Commenters' opinions of this provision varied, from those who opposed any kind of fuel storage underground, those who recommended limited storage, to those who believed that diesel fuel could be safely stored underground. The final rule balances the concerns raised by those opposed to storage against the need to store fuel underground to minimize other fuel handling hazards. The fire protection and construction requirements for fixed storage tanks and permanent storage facilities in §§ 75.1903 and 75.1904 of the final rule appropriately and adequately address fire and other hazards involving diesel fuel, and, when satisfied, will afford safe storage of the fuel quantities allowed under this section.

Under the final rule, the storage of safety cans and parking of fuel transportation units in permanent storage areas would also be permitted. The 1,000-gallon limit applies to the total capacity of stationary tanks in the fuel storage facility, and the quantity of fuel in safety cans stored or fuel transportation units parked in the facility would not be counted as part of the 1,000-gallon limitation under this paragraph.

The final rule permits storage of diesel fuel on a working section or in an area of the mine where equipment is being installed or removed, but places specific restrictions on such storage in paragraphs (c)(1) through (c)(4) of this section.

The proposal did not separately address storage of diesel fuel on a working section. MSHA received many comments both opposing and supporting section fuel storage. Those opposed stated that storage on the section would present fuel leakage and spillage hazards, creating fire and escape hazards for miners. Those supporting fuel storage on the section stated that, because the production section advances rapidly, the final rule must permit diesel fuel storage on the section. These commenters further stated that properly designed fuel transportation units should be allowed on mining sections, as long as they are parked within reasonable proximity to

the work area and comply with specific safety requirements.

MSHA agrees with commenters who supported allowing mobile fuel storage on the section, which can move as mining progresses, but also agrees with commenters who believe that such storage must be carefully controlled. In response to these concerns, paragraph (c)(1) permits only one temporary diesel fuel storage area for each working section or in areas of the mine where equipment is being installed or removed. Paragraph (c)(2)(i)–(iii) requires that the temporary fuel storage area be located within 500 feet of the loading point; within 500 feet of the projected location of the future loading point where equipment is being installed; or within 500 feet of the location of the last loading point where equipment is being removed. This requirement will ensure that the fuel storage area will be located close enough to miners to allow any hazards that may develop to be quickly addressed. This provision is a logical outgrowth of the rulemaking because it addresses commenters' concerns that fuel storage be allowed in close proximity to the mining section, while at the same time recognizing that safety concerns dictate limitations on where fuel may be stored.

Consistent with the final rule's approach of allowing limited storage on the section, paragraph (c)(3) prohibits more than one diesel fuel transportation unit at a time to be parked in a temporary diesel fuel storage area. This requirement is consistent with sound fire protection engineering principles for the storage and handling of diesel fuel, and is supported by experiences in the field and applicable NFPA standards. It should be noted, however, that a ''parked'' diesel fuel transportation unit under this paragraph would not include a unit that is in the process of refueling equipment or that is itself being refueled. This means, for example, that a temporary fuel storage area could contain more than one diesel fuel transportation unit at one time, so long as only one unit is parked. Any other units in the area must be in use and attended.

The proposal would have allowed fuel to be stored in free-standing tanks in mobile diesel fuel storage facilities. The final rule allows fuel to be stored in temporary fuel storage areas, but only in tanks on diesel fuel transportation units. These units are specially designed to provide both mobility and protection for the fuel tanks. Protection is provided by requiring the tank to be permanently affixed to the transportation unit. The construction and design requirements for fuel tanks are contained in § 75.1904 of the final rule.

Paragraph (d) of this section of the final rule imposes limitations on the location of permanent fuel storage facilities and temporary fuel storage areas, and has been revised from the proposal for clarity. This aspect of the final rule requires diesel fuel to be kept out of areas where the potential for fire is greatest. The final rule prohibits permanent storage facilities and temporary storage areas from being located within 100 feet of shafts, slopes, shops, or explosives magazines, or within 25 feet of trolley wires or power cables, or electric equipment not necessary for the operation of the storage facilities. The fuel storage facilities or areas must also be in a location protected from damage by other mobile equipment.

Some commenters stated that the proposed requirement that diesel fuel storage facilities be located at least 100 feet away from shafts, slopes, or shops was not adequate in light of the amount of diesel fuel involved and the amount of spillage that could occur. Another commenter stated that requiring shops to be located at least 100 feet away from fuel storage facilities was inconsistent with proposed § 75.1903(c), which would have prohibited welding and cutting within 50 feet of storage facilities. The commenter also noted that in some cases it may be best to locate the fuel storage facility within 100 feet of the shop near a return, because this would provide the best direct ventilation to the return for both the shop and storage facility, but that the proposed 100-foot requirement could prevent this. The final rule, like the proposal, adopts separation distances that are consistent with the National Fire Protection Association 123 Standard for Fire Prevention and Control in Bituminous Coal Mines. NFPA 123 requires fixed combustible liquid storage areas to be located a minimum of 100 feet from explosive magazines, electrical substations, shaft stations, and shops. MSHA disagrees with commenters who considered a 100-foot separation distance insufficient in light of the amount of diesel fuel that could be stored. The design, construction, and fire suppression system requirements in the final rule that apply to permanent fuel storage facilities provide adequate protection to miners with a 100-foot separation distance.

MSHA also disagrees with the commenter who believed that requiring shops to be located at least 100 feet away from fuel storage facilities, where cutting and welding are likely to occur, was inconsistent with a prohibition against welding and cutting within 50 feet of storage facilities. The high volume of vehicle traffic in and out of the area of the shop warrants a greater separation distance than for cutting and welding alone.

Finally, the final rule does not adopt the recommendation of the commenter who advocated allowing a permanent fuel storage facility closer to a shop than 100 feet, to allow better ventilation of both the shop and the storage facility. The fire protection afforded by the 100-foot separation distance outweighs any advantage in ventilation that would result from allowing a lesser distance.

Paragraph (d)(3) provides that permanent fuel storage facilities and temporary fuel storage areas must be in a location that is protected from damage from other mobile equipment. Under the proposal, fuel storage facilities would have been required to be at least 25 feet away from haulageways, which are entries where miners and materials are normally transported. The rationale for this requirement was that areas where diesel fuel is stored should be out of the line of mine traffic, where tanks would be exposed to damage from collision with other mine vehicles. Instead of adopting the proposed requirement, the final rule takes a performance-oriented approach by providing that storage facilities and areas be located where they are protected from damage. This responds to a commenter who indicated the importance of keeping fuel storage facilities out of the line of traffic.

Paragraph (e) prohibits permanent fuel storage facilities from being located in the primary escapeway, which provides miners with a route of escape from the mine in the event of an emergency. This restriction was not included in the proposal, but has been added to this section of the final rule in response to commenters' concerns relative to diesel fuel storage facilities' impeding miners' ability to escape in the event of a mine fire, explosion, or other emergency. This prohibition recognizes that the primary escapeway should be kept clear of obstructions and potential hazards, to ensure that miners are able to safely evacuate the mine in the event of an emergency.

Section 75.1903 Diesel Fuel Storage Facilities And Areas; Construction And Safety Precautions

This section of the final rule establishes construction and design requirements for permanent diesel fuel storage facilities and temporary diesel fuel storage areas. These requirements are intended to minimize fire hazards associated with storage of diesel fuel

underground, and provide safety protections for miners during the storage, transportation, and dispensing of diesel fuel.

The proposal did not distinguish between construction and design requirements for those diesel fuel storage facilities that are fixed and remain in one location indefinitely, and those that move as the production section advances. A number of commenters stated that the proposed requirements were suitable for permanent facilities but were unnecessary and impractical for facilities that would be temporary. Some commenters were concerned that some mine operators would not be able to complete construction of the temporary facility before the facility would have to be moved to keep pace with the advancing section. In support of this position, commenters stated that compliance with the proposed requirements would be impractical and would force mine operators to transport fuel to the section to refuel equipment on a shift basis, creating increased hazards due to transportation.

Another commenter voiced similar concerns, noting that the rapid advance of mining in modern underground coal mines makes it more practical for fuel stations to be advanced with mining activity, and that properly designed transportation units should be allowed on mining sections as long as they are parked in accordance with specific safeguards in reasonable proximity to the working area. The commenter stated that a specific parking requirement with proper safeguards would be much safer than the requirements in MSHA's proposal. Another commenter stated that the Diesel Advisory Committee made general recommendations for permanent and temporary storage facilities that were not intended to eliminate fuel trailers and their use. On the other hand, several commenters believed that the fact that the proposal would not have required mobile storage facilities to have a drain system and sump would provide no incentive for operators to construct fixed facilities, and that the construction of an unlimited number of mobile facilities would result.

In response to the comments, the final rule reflects a clear distinction between construction and design requirements for permanent underground diesel fuel storage facilities and temporary underground diesel fuel storage areas. MSHA recognizes that temporary diesel fuel storage areas move frequently as mining advances, and that construction specifications must take this fact into account. Requirements for permanent storage facilities have therefore been addressed separately from those for temporary facilities in the final rule. The final rule provides a more practical approach for the construction and design of areas designated for temporary fuel storage, and eliminates several proposed construction requirements that are unnecessary from a fire protection engineering standpoint. Specifically, the final rule does not adopt the proposed requirements that temporary fuel storage areas be constructed of noncombustible material, be provided with a self-closing door, and be provided with a fire suppression system. Because construction of temporary storage areas with these features would make it extremely difficult for these facilities to be built as fast as mining progressed, transportation of fuel between permanent storage facilities and the section would increase significantly. The risk of an accident involving a fuel transportation unit would also increase, and with it the risk of fuel spillage and the risk of fire. The final rule therefore reduces the construction requirements for temporary fuel storage areas, to provide better control of the fire hazards inherent in fuel transportation and storage.

Paragraphs (a)(1) through (a)(7) of this section establish construction and design requirements for permanent underground diesel fuel storage facilities. Consistent with basic fire protection engineering principles, the final rule requires permanent storage facilities to be constructed of noncombustible materials; provided with self-closing doors or a means for automatic enclosure, and with a means for entry and exit after closure; ventilated with intake air; equipped with an automatic fire suppression system; and provided with a means to contain diesel fuel and with a concrete floor or equivalent to prevent spills from saturating the mine floor. These requirements are intended to reduce the fire hazards inherently present in areas where diesel fuel is stored and increase protection in the event of a fire.

The proposal contained requirements similar to those in the final rule, but the final rule has been modified in response to commenters. Some commenters were generally opposed to the proposed requirements, stating that diesel fuel systems currently in use do not pose the degree of hazard that would warrant such extensive requirements. One commenter stated that the requirements of the proposal suggested that the hazards of diesel fuel storage exceed the hazards of the storage of explosives underground by several-fold. Other commenters stated that the proposed requirements for construction of storage facilities with noncombustible materials and with a means for automatic enclosure were too vague and not stringent enough. These commenters recommended that MSHA require at a minimum that diesel fuel be stored in an enclosure with at least a 2-hour fire-resistance rating.

Paragraph (a)(1) provides that permanent underground fuel storage facilities shall be constructed of noncombustible materials, including floors, roofs, roof supports, doors, and door frames. Exposed coal within the fuel storage areas is required to be covered with noncombustible material. If they are used, bulkheads are required to be built of or covered with noncombustible material.

The proposal would have required that the storage facility be constructed of noncombustible material, a term that was not specifically defined. As discussed above, the term ''noncombustible materials'' is defined in § 75.1900 of the final rule as materials meeting the equivalent of a one-hour fire resistance rating test. Paragraph (a)(1) also incorporates NFPA 123 requirements. These requirements clarify which components of the facility must be noncombustible, including floors, roofs, roof supports and door frames, and specify that exposed coal must be covered with noncombustible material and bulkheads either built of or covered with noncombustible materials.

MSHA's Approval and Certification Center has established guidelines to determine the suitability of trowelable or sprayable coatings for protecting coal surfaces against fire, which meet the requirements of paragraph (a)(1). In addition, textile-type thermal barriers may also be used to provide isolation of the combustible surfaces within the storage facility. Materials meeting the ''Performance Criteria for Materials used for Welding and Cutting Curtains and/or Thermal Barriers in Underground Coal Mines'' (Luzik, MSHA Report No. 01–098–92) may also be used. MSHA has also established guidelines for noncombustible doors. Additionally, MSHA has tested certain designs of high-temperature silica fabric curtains and published the results in *Coal Magazine,* June 1993, pp. 102–104, ''MSHA Develops New Fire Resistant Check Curtains''. For purposes of the final rule, MSHA will accept as doors the curtain constructions described in this article. Facilities constructed to meet these requirements will afford protection to miners working in the production areas inby in the event of a fire and should provide ample time for miners to exit.

Paragraph (a)(2) of the final rule requires that permanent fuel storage facilities be provided with either self-closing doors or a means for automatic enclosure. This paragraph provides mine operators with flexibility in the method used to comply with the final rule. The proposal would have required that the facility be provided with a means for automatic enclosure, which suggests that the door must be closed by powered means, such as electrically or pneumatically. The proposal did not specifically include non-powered self-closing doors as an alternative, although they were not intended to be excluded. Self-closing doors serve the same function in containing a fire as automatic-closing doors, and the final rule clarifies that they are permitted.

Paragraph (a)(3) requires that permanent fuel storage facilities be provided with a means for personnel to enter and exit the facility after closure. This provision has been added to the final rule to ensure that miners who are inside the fuel storage facility when the automatic enclosure activates will be able to exit from the facility. This requirement is also intended to allow miners to gain access to the facility to suppress an incipient fire that may develop. This paragraph also requires a means for exit and entrance when self-closing doors are used. Self-closing doors that are specifically designed to be manually opened would be in compliance with this paragraph. This aspect of the final rule is necessary to prevent miners from being trapped in the facility, and is a logical outgrowth of the rulemaking.

Paragraph (a)(4) of this section of the final rule requires that permanent fuel storage facilities be ventilated with intake air that is coursed into a return air course or to the surface and that is not used to ventilate working places, using ventilation controls meeting the requirements of existing § 75.333(e). The proposal would have required that both fixed and mobile fuel storage facilities be ventilated directly into a return air course using noncombustible materials for ventilation controls. Some commenters stated they were already venting fuel storage areas in their mines directly to the return.

The final rule adopts the proposed requirement only for permanent fuel storage facilities, with some modification. The final rule requires that the facility be ventilated with intake air coursed to a return air course or to the surface that is not used to ventilate working places. This language, which is consistent both with existing requirements at § 75.340 for the ventilation of underground electrical installations and with the current definition of ''return air'' in existing § 75.301, is intended to eliminate the confusion caused by the phrase ''directly to a return air course''. The final rule clarifies that the intake air ventilating the fuel storage facility may not be used to also ventilate active working places. Thus, the air may be coursed into other entries before being coursed into a return, so long as the air is not used to ventilate a working place.

Temporary underground diesel fuel storage areas are not required to be vented directly to the return in the final rule, in response to commenters who advocated more flexibility and less restrictive requirements for temporary fuel storage that moves as mining progresses.

If the permanent facility is equipped with self-closing doors that would normally be closed, an opening will have to be provided in the doors to allow intake air to flow through the facility. This opening will prevent the build-up of diesel fuel vapors in the facility and prevent smoke generated during the incipient stages of a fire from entering the intake air courses. The opening is not intended to prevent smoke and other products of combustion from backing up into the intake airway if the fire is not extinguished in its incipient stages. For automatic closing doors, which would normally be open, a vent in the doors may not be needed since enclosure is required to seal the facility to cut off oxygen to the fire after the doors have closed.

The requirements of paragraph (a)(4) are also intended to ensure that, if an enclosure has self-closing doors that are normally closed, precautions are taken to adequately vent diesel exhaust emissions from the facility. Such precautions could include the use of a regulator in the door to bring air into the facility that would then be vented to the return. In the case of a diesel fuel transportation unit that must have its engine running to dispense fuel, the unit's exhaust could be vented either directly to the return, if it incorporates a power package approved under subpart F of part 7, or into intake air which is coursed directly to a return air course. A fuel transportation unit that is equipped with a subpart F-approved power package will have fire and explosion prevention features that would permit the engine to exhaust directly into the potentially methane-rich atmosphere of the return. When the unit is exhausted into intake air, the fire and explosion prevention features of a subpart F power package are not required. However, the emissions from the engine must be vented directly to return air to prevent unnecessary exposure of miners to diesel exhaust.

Paragraph (a)(5) adopts the requirements of the proposal and provides that permanent fuel storage facilities must be equipped with an automatic fire suppression system that meets the requirements of § 75.1912 of the final rule. This paragraph also includes an additional requirement, not included in the proposal, that actuation of the automatic fire suppression system shall initiate the means for automatic enclosure. One commenter stated that the proposed requirement for automatic enclosure was not sufficiently stringent, that these storage facilities should be designed with fire containment capability, and that automatic enclosure should be triggered by actuation of the automatic fire suppression system. MSHA agrees, and the final rule enhances the capabilities of the automatic fire suppression system by requiring that initiation of the system will activate closure of the doors to the facility if self-closing doors are not used. Operation of the system in an environment with minimal air movement, which would exist when the doors are closed, will improve the effectiveness of fire suppressant agents in extinguishing a fire.

Paragraph (a)(6) requires that permanent fuel storage facilities be provided with a means of containment capable of holding 150 percent of the maximum capacity of the fuel storage system. This provision is intended to address hazards associated with diesel fuel spillage and leakage—both slip and fall and fire hazards. The proposal would have required that permanent facilities be equipped with a drain system and a sump capable of holding 150 percent of the maximum capacity of the fuel storage system. Instead of requiring a drain system and sump, the final rule requires a ''means of containment''. This change acknowledges that a suitable drain system is generally considered overly difficult to design and install, and will also allow more flexibility in design of fuel containment systems. Additionally, spilled diesel fuel is best left confined in the facility where the fire suppression system is located. One commenter offered a case that illustrates this principle where the fuel escaped into the mine during a fuel spill because the drain valve at the bottom of the remote sump that serviced the storage area was left partially open.

It is important to note that, in cases where fuel is piped from the surface to an underground fuel storage facility, the containment capacity must account for

the total fuel capacity. This means that the capacity of the containment must equal at least 150 percent of the surface tank's capacity, plus 150 percent of the underground tank's capacity, plus 150 percent of the volume of the piping system connecting the surface tank to the underground tank. In cases where there is no underground tank, the maximum capacity includes the surface storage tank and the piping system from the surface. Where a stationary tank is located in a permanent facility and is not connected to a surface tank, the means of containment must account for 150 percent of the capacity of the largest stationary tank. If the underground fuel storage facility is not equipped with a stationary tank but is used for the storage of only diesel fuel transportation units, the single largest transportation unit tank would be counted in the maximum capacity for purposes of this paragraph. However, diesel fuel transportation units that may be parked in permanent fuel storage facility where a piping system from the surface terminates or where a larger stationary tank is housed would not be considered part of the ''fuel storage system'', and the capacity of the transportation unit tank would not be included. The rationale behind this is that only one component in a fuel storage facility would be expected to fail at one time, such as a burst piping system or a leak in a stationary tank or in a transportation unit tank.

In support of the requirement of this paragraph, one commenter noted that a fuel spill occurred when valves in the piping system from the surface storage tank failed, allowing the static head pressure to be imparted on the dispensing hose which caused it to rupture and fuel to escape.

Commenters stated that it is important that the storage location be designed to contain fuel spills and tank ruptures to stop the spread of fuel. The final rule's containment capacity requirement of 150 percent of the capacity of the fuel system will provide a prudent safety factor in view of the potential fire hazard created by the release of large amounts of diesel fuel into an underground mine.

Paragraph (a)(7) has been added to the final rule and requires that permanent fuel storage facilities be provided with a competent concrete floor or equivalent to prevent fuel spills from saturating the mine floor. This provision is intended to ensure that spilled diesel fuel can be easily cleaned up and will not accumulate, creating a fire hazard. This requirement is added in the final rule in response to commenters who suggested that the floor of the storage facility should be noncombustible and impermeable to oil and diesel fuel. These commenters argued persuasively that a requirement for a concrete floor would preserve the integrity of a noncombustible facility.

Under the requirements of this paragraph a permanent fuel storage facility must be provided with a competent floor made of concrete or an equivalent material. The term ''competent'' is used to make clear that a cracked concrete floor or a porous mine floor would not satisfy this requirement. A brattice-type lining or rubber membrane would not be considered equivalent because it could easily be torn during refueling of vehicles, and diesel fuel could leak through and accumulate underneath. This provision has been added to the final rule in direct response to commenters, many of whom testified at the Agency's public hearings on the proposal. MSHA believes that this provision constitutes a logical outgrowth of the proposal because of commenters' stated concerns in ensuring that spilled fuel will not saturate the mine floor and create a fire hazard.

The requirements of paragraph (b) of this section of the final rule apply to both permanent underground fuel storage facilities and temporary underground fuel storage areas. This paragraph requires that these storage facilities or areas be: equipped with a 240 pounds of rock dust and at least two fire extinguishers, or, in the alternative, with at least three fire extinguishers; be conspicuously marked; and be maintained to prevent the accumulation of water. These basic requirements address potential fire hazards in these facilities and ensure that mine personnel are aware of the presence and location of such facilities.

Paragraph (b)(1) requires that permanent fuel storage facilities and temporary fuel storage areas be equipped with at least 240 pounds of rock dust and provided with two portable multipurpose dry chemical type (ABC) fire extinguishers that are listed or approved by a nationally recognized independent testing laboratory and have a 10A:60B:C or higher rating. Both extinguishers must be easily accessible to personnel, and at least one must be located outside of the facility or area, upwind of the facility in intake air. Paragraph (b)(2) provides, as an alternative to the requirement of paragraph (b)(1), that three fire extinguishers may be provided.

The proposal would have required fixed and mobile fuel storage facilities to be equipped with at least two 20-pound multipurpose dry chemical type fire extinguishers, and would not have required that rock dust be provided. One commenter recommended that foam generating machines or fire extinguishers of 150 pounds or more be required. The final rule does not adopt the suggestion of this commenter, because MSHA considers it too hazardous to fight a diesel fire underground that cannot be extinguished in its incipient stages. The fire extinguishers and fire suppression equipment required by this section are intended to be used to extinguish small fires, such as could occur on equipment in the facility.

The final rule redefines the type of dry chemical extinguishers that are required, based on specifications recommended by the National Fire Protection Association for the particular hazard involved. The rating of the fire extinguishers has been adopted from NFPA 123 and is in accordance with NFPA 10–Standard for Portable Fire Extinguishers. Also, extinguishers must be listed or approved by a nationally recognized independent testing laboratory, which provides assurance that the extinguishers will perform effectively in the event of a fire emergency. The final rule requires that the fire extinguishers be located so that miners will have quick access to them in the event of a fire. To allow flexibility in complying with the requirements of this paragraph, the final rule addresses the location of only one fire extinguisher. The location of the other extinguisher should be determined based on mine conditions and the particular usage of the facility. The final rule specifies that the fire extinguisher be located upwind of the facility, which has been added to ensure that if a fire occurs miners will be able to reach the fire extinguisher without being exposed to the heat or smoke of the fire.

The final rule adds a requirement for 240 pounds of rock dust to be kept in the storage facility in response to comments concerning the effectiveness of rock dust in fighting diesel fuel fires and the ability of rock dust to contain spills. The requirement for 240 pounds of rock dust is consistent with § 75.1100–2(f), which requires 240 pounds of rock dust to be provided at permanent underground oil storage stations, and is included in the final rule as an added measure of fire protection in response to the concerns of commenters. However, paragraph (b)(2) allows an additional fire extinguisher to be substituted for the rock dust required under paragraph (b)(1), which is consistent with provisions in existing petitions for

modification for fire protection at electrical installations. The requirements of the final rule strike a balance between those commenters concerned about the need for additional fire protection provided by rock dust in locations where diesel fuel is stored, and those who were concerned that the storage of rock dust in those locations was inadvisable in mines that tended to be wet.

Paragraph (b)(3) adopts the requirement of the proposal that permanent diesel fuel storage facilities and temporary fuel storage areas be identified with conspicuous markings designating diesel fuel storage. The proposal would have required the facilities to be designated as ''combustible liquid storage,'' but MSHA has concluded that precise identification as areas of diesel fuel storage is more appropriate, and will ensure that mine personnel are aware of the locations where diesel fuel is stored underground.

Paragraph (b)(4) requires that fuel storage facilities or areas be maintained to prevent the accumulation of water. The proposal would have required that fixed and mobile underground storage facilities be located in an area as dry as practicable, a concept which several commenters considered to be vague and potentially difficult to comply with. This requirement has therefore been revised to require that permanent underground diesel fuel storage facilities and temporary fuel storage areas be maintained to prevent the accumulation of water. This provision recognizes that tanks or other components of the storage facility may corrode as a result of exposure to water. Additionally, accumulated water can increase the fire hazard present by a fuel spill, because diesel fuel will float on top of water and may be spread more easily throughout the storage facility. The requirement of this paragraph addresses these hazards.

Paragraph (c) adopts the proposed prohibition on welding or cutting, except as provided in paragraph (d) of this section, from being performed within 50 feet of a diesel fuel storage facility or area. This requirement is intended to minimize fire hazards and is consistent with National Fire Protection Association requirements (NFPA 123). No comments were received on this aspect of the proposal.

Paragraphs (d)(1) and (d)(2) adopt the requirements of the proposal and set forth specific precautions to be followed when welding, cutting, or soldering pipelines, tanks, or other containers that might have contained diesel fuel. MSHA received only a few comments on this aspect of the proposal, which is consistent with NFPA requirements. A review of MSHA's accident data reveals that a fatal accident occurred when the victim was welding a diesel fuel storage tank. The victim had drained the tank, which had been filled with water, and attempted to repair a small leak which remained in the tank. Vapors from the residual fuel were ignited by the heat of welding, and the tank exploded. The requirements of this paragraph are intended to address such hazards, and recognize that welding can be performed safely underground as long as appropriate safeguards are followed. Additionally, the large size of certain vessels used for the storage of diesel fuel underground would make it impractical to restrict welding of such containers to the surface. The precautions in paragraph (d)(1) include thoroughly purging and cleaning or inerting the pipelines, containers, or tanks before welding or cutting, with a vent or opening provided in the container or tank to release pressure before heat is provided. The final rule also prohibits diesel fuel from entering pipelines, tanks, or other containers that have been welded, soldered, brazed, or cut until the metal has cooled to ambient temperature. A slight change has been made in the language of this requirement to conform the references to the diesel fuel containers that are the subject of these requirements. The phrase ''pipelines, tanks, or other containers'' is used throughout. Additionally, the reference in proposed paragraph (d)(1) to containers or tanks that ''have contained combustible or flammable materials'' has been changed in the final rule to pipelines, tanks or other containers ''that have contained diesel fuel,'' to eliminate the inconsistency that existed between this provision and other language in this paragraph and to clarify the scope of these requirements.

One commenter recommended that a cleanup program be required for underground fuel storage facilities and areas. This recommendation has not been adopted in the final rule, because existing § 75.400–2 already requires mine operators to establish and maintain programs for regular cleanup of accumulations of coal and other combustibles. MSHA will require that underground diesel fuel storage facilities and areas be covered by the cleanup program under § 75.400–2, which will ensure that these locations are kept clear of any combustible materials.

Section 75.1904 Underground Diesel Fuel Tanks And Safety Cans

This section includes requirements for the design of diesel fuel tanks and safety cans and for emergency venting devices for diesel fuel tanks for venting vapors to protect against the buildup of pressure in the tank, which could lead to its rupture if the tank is exposed to fire. The requirements of this section are responsive to comments and are consistent with NFPA, Underwriters Laboratories, and American Petroleum Institute standards for storage tanks for combustible liquids. A number of commenters suggested restructuring and reorganizing the proposed design requirements for diesel fuel tanks, and the final rule is revised in response to these comments.

Paragraph (a) of this section of the final rule contains construction and location requirements for underground diesel fuel tanks in permanent underground fuel storage facilities and temporary underground fuel storage areas. These requirements are intended to guard against leakage of diesel fuel and to minimize fire hazards.

Paragraph (a)(1) requires that underground diesel fuel tanks have steel walls of a minimum 3⁄16-inch thickness or walls made of other metal of a thickness that provides equivalent strength. This specification has been added to the final rule to ensure that diesel fuel storage tanks are properly designed for their intended purpose, and in response to commenters who were concerned that diesel fuel tanks be durably constructed. MSHA explored alternatives for an objective measurement of durable construction. The requirement of this paragraph is consistent with prevailing industry standards, and is intended to serve as a minimum design standard for substantially constructed tanks. This requirement is derived from Department of Transportation (DOT) Spec. 51 Section 178–245–2(b), and is consistent with DOT requirements for over-the-road vehicles that transport diesel fuel. This specification is also recognized by the National Fire Protection Association in many of its fire protection standards as a design guideline for tanks used for storage of combustible liquids. Manufacturers of fuel transportation units currently produce diesel fuel storage tanks with 3⁄16-inch thick steel walls, and this specification will allow mine operators to buy diesel fuel tanks off-the-shelf.

Paragraph (a)(2) requires diesel fuel tanks to be protected from corrosion. The proposal would have required these tanks to be constructed of ''noncorrosive

material.'' The language of the final rule will allow mine operators the option of either using a tank that has been constructed of noncorrosive material, such as galvanized or stainless steel, or of protecting a tank from corrosion that has been constructed of an oxidizing material, such as common steel. Protection from corrosion can be achieved by applying a protective coating.

Paragraph (a)(3) requires diesel fuel tanks to be of seamless construction or fabricated with liquid tight welded seams. MSHA has added this requirement to the final rule in response to comments raising concerns about the durability of fuel tanks in use underground, to provide an objective measurement of substantial construction. Bolted and crimped joints are not allowed under the final rule because they are prone to leakage. The requirement of this paragraph is consistent with DOT Spec. 51 Section 178–245–2(b), and is intended to ensure that diesel fuel tanks are well constructed and designed not to leak.

Paragraph (a)(4) requires that diesel fuel tanks not leak, and has been added in the final rule in response to commenters' concerns that tanks not contribute to a fire. Under the final rule, all attachments to the tank, such as vents, caps, hoses, pumps, valves, and nozzles, must also be free from leaks. Many commenters were concerned with leakage hazards presented by the storage of diesel fuel underground. These commenters were particularly concerned about leakage in temporary diesel fuel storage areas. MSHA believes that the requirement of this paragraph, in conjunction with the other provisions in this final rule, will greatly minimize hazards associated with storage of diesel fuel underground.

Paragraph (a)(5) requires stationary tanks in permanent underground diesel fuel storage facilities to be placed on noncombustible supports so that tanks are at least 12 inches above the floor. Under the proposal such tanks would have been required to be supported by concrete, masonry, protected steel, or equivalent supports. Steel supports, except for steel saddles less than 12 inches from the floor, would have been required to be protected by materials having a fire resistance rating of not less than two hours. The proposal did not specify the minimum distance the tank must be from the floor. Commenters stated that positioning tanks at least 12 inches off the floor would allow for proper cleaning, rock dusting and quick detection of leaks. MSHA agrees with these comments and has revised the final rule accordingly. Additionally, the final rule provides that the tank supports must be made of noncombustible material, which is defined in § 75.1900 of the final rule, making unnecessary the reference in the proposal to ''concrete, masonry, protected steel, or equivalent supports''. The reference has therefore not been adopted in the final rule.

Paragraph (b)(1) requires diesel fuel tanks to be provided with devices for emergency venting that are designed to open at a pressure that does not exceed 2.5 pounds per square inch. Under this requirement, the venting devices must also meet minimum size requirements based on the capacity of the tank. The rule provides minimum vent device specifications for two ranges of tank sizes: tanks with a capacity of 500 gallons or less and tanks with a capacity of more than 500 gallons. The requirements of this section are incorporated in NFPA standards for portable tanks for transporting and storage of combustible liquids, as well as in American Petroleum Institute design standards. These vents are designed to activate at a pressure which is below the expected yield point of the tank and to provide the necessary volumetric flow rate to maintain safe internal pressure if the tank shell were to heat up as a fire develops. Opening of the device will allow the vapors to be safely vented and will prevent the tank from rupturing under this condition. Some commercially available emergency vents have been listed or approved by nationally recognized independent testing laboratories and can be expected to provide adequate pressure relief in a fire situation. The vent sizes required in the final rule were determined by design calculations outlined in National Fire Protection Association, Underwriters Laboratories, and American Petroleum Institute standards for a range of tank sizes typical for underground diesel fuel storage. These calculations take into account the probable maximum rate of heat transfer per unit area; the size of the tank and the percentage of the area likely to be exposed; the time required to bring the tank contents to a boil; the time required to heat unwet portions of the tank shell or roof to a temperature where the metal will lose strength; and the effect of drainage, insulation and the application of water in reducing the fire exposure and heat transfer. MSHA believes that specifying the minimum size of vent for two ranges of tank sizes is preferable to a requirement that would require the operator to design vents for a given size. The types of emergency vents required under this paragraph are commercially available and relatively inexpensive. The requirement of this paragraph respond to concerns of commenters regarding the hazards of fuel storage underground.

Paragraph (b)(2) requires tethered or self-closing caps for stationary tanks in permanent underground diesel fuel storage facilities, and self-closing caps for diesel fuel tanks on diesel fuel transportation units. The proposed rule would have required self-closing caps for all diesel fuel storage tanks, and did not include the alternative of a tethered cap for stationary tanks. One commenter suggested that self-closing caps are not needed on fixed tanks since they are unlikely to incur fuel spillage. The final rule permits the optional use of a tethered cap for stationary tanks, which adds flexibility and provides the same degree of protection as a self-closing cap.

Paragraphs (b)(3), (b)(4), (b)(5), and (b)(6) are unchanged from the proposal, with the exception of paragraph (b)(6) which has been revised to reflect commenters' concerns with respect to the location of shutoff valves. Paragraph (b)(3) addresses the size of vents, and will permit the free flow of fuel out of the tank without creating a vacuum in the tank that could damage its shell. Paragraph (b)(4) addresses requirements for liquid tight connections, and will minimize the risk of leaks and the resulting risk of fire. Paragraph (b)(4)(i) requires that liquid tight connections for all tank openings be identified by conspicuous markings that specify the function. Because this provision is performance-oriented and allows the mine operator to choose the manner in which markings identify connections, MSHA anticipates the burden time under the Paperwork Reduction Act of 1995 to be minimal.

Paragraph (b)(5) addresses requirements for vent pipes, and will minimize the possibility of fuel leaking from vent lines.

Paragraph (b)(6) is derived from proposed § 75.1906(c)(5) and requires that shutoff valves be located as close as practicable to the tank shell. The proposal would have required shutoff valves to be located within 1 inch of the tank shell. Because shutoff valves that extend for any distance from the fuel tank can be inadvertently damaged or broken off, making it impossible to shut off the flow of liquid from the fuel tank, the valves must be located close to the tank where they are protected from damage. However, one commenter was concerned that the proposal was too restrictive because it may not always be possible from a practical standpoint to locate the shutoff valve within 1 inch of

the tank shell. The final rule responds to this commenter's suggestion by allowing greater flexibility, and provides that the valve be located as close as practicable to the tank shell.

Paragraph (b)(7) adopts the requirement of the proposal for an automatic closing, heat-actuated valve on each withdrawal connection below the liquid level. The final rule does not adopt the proposed exception for connections used for emergency disposal, because this exception is not relevant to underground coal mines. The proposed rule required the installation of heat-actuated shutoff valves only on tanks in fixed storage facilities. The final rule extends this requirements to all diesel fuel tanks used underground, which would include tanks on diesel fuel transportation units. Automatic closing, heat-actuated valves shut the flow of fuel off when exposed to high temperatures. These valves prevent additional fuel from being discharged from the tank in the event of a fire. This requirement has been extended to tanks on transportation units, and is warranted in light of the scaling back of construction requirements for temporary fuel storage areas in the final rule in response to commenters' concerns that the requirements were impractical.

Paragraph (c) addresses tanks with openings for manual gauging, and requires that liquid tight, tethered or self-closing caps or covers be provided and be kept closed when not open for gauging. The alternative of tethered caps or covers has been added to the final rule for flexibility. MSHA believes the use of self-closing or tethered caps will provide necessary protection against overflow.

Paragraph (d) requires that surfaces of the tank and its associated components be protected against collision. This provision has been added to the final rule in response to commenters who were concerned about protecting the tanks from moving equipment. MSHA agrees that it is essential that diesel fuel storage tanks be protected from damage by collision with other equipment. Stationary tanks in permanent fuel storage facilities may need guards or barricades, depending upon their location, to prevent moving equipment from colliding with the tank.

Paragraph (e) sets forth requirements for leakage tests for tanks and their associated components, except that tanks and components connected directly to piping systems must be properly designed for the application. The final rule requires a leakage test at a pressure equal to the working pressure. The proposed rule would have required both a strength test and a leakage test, at a pressure equal to the static head, for diesel fuel storage tanks before the tanks were placed in service. Commenters recommended that tanks and their connections be tested at a pressure twice the working pressure.

The final rule does not require testing at twice the working pressure, in light of the detailed construction and design requirements for diesel fuel storage tanks in the final rule. The term ''static head'' in the proposed rule has been replaced with the term ''working pressure'' in the final rule. Although the meanings are the same in this context, the term ''working pressure'' is more widely used and more commonly understood in the mining industry. Compliance with the requirement of this paragraph will provide protection from hazards associated with leakage of diesel fuel underground. Under the final rule, mine operators are expected to verify that no leaks exist after installing the tank underground and connecting all of the tank's associated components before placing the tank in service. All components must be rated for the working pressures in the system. Both the static head and the maximum pump pressure, if applicable, must be considered when designing and selecting tanks and associated components connected to a piping system. For tanks connected to a piping system from the surface, the static head pressure could easily exceed several hundred pounds per square inch (psi), either during normal operation or because of a fault in the system. For these systems, MSHA advises mine operators to plan for a worst-case (highest pressure) scenario and select a tank and tank components that are designed for use at this pressure.

MSHA has concluded that the strength test for tanks that was included as part of the proposal is unnecessary, given the other specifications for tanks. This proposed requirement has therefore not been included in the final rule.

The proposal would have imposed additional requirements on tanks in underground diesel storage facilities that were not located in ''dry areas.'' Such tanks would have been required under the proposal to be placed on noncombustible supports so that the tanks were at least 6 inches above water or wet bottom, and such tanks would also have been required to be constructed of noncorrosive material. Commenters stated that the concept of ''dry areas'' was ambiguous and should not be adopted. MSHA agrees with these comments, and this aspect of the proposal has therefore not been included in the final rule. However, under the final rule, stationary tanks in permanent underground storage facilities must be placed on noncombustible supports at least 12 inches above the floor to allow for proper cleaning, rock dusting and quick detection of leaks. Tanks will also be protected by this requirement from wet floors. Further, the final rule requires all diesel fuel storage tanks to be protected from corrosion. These requirements will ensure that tanks are sufficiently shielded from water damage.

Paragraph (f) establishes design and size requirements for safety cans. These requirements have been added to the final rule to ensure that small amounts of diesel fuel can be transported and stored in a safe manner. Although the proposed rule contemplated the use of safety cans to transport small amounts of diesel fuel underground, the proposal would not have set design requirements for safety cans. Commenters were concerned that widespread and uncontrolled use of safety cans underground would result in fuel spills and accumulations on mine equipment and mine floors. The provisions of this paragraph are intended to address commenters' concerns about the hazards presented by safety cans used to store and transport diesel fuel in the underground mine environment.

The final rule establishes specific design requirements for safety cans. As indicated in the discussion of § 75.1900, the term ''safety can'' is defined in the final rule as a metal container intended for storage, transport or dispensing of diesel fuel with a nominal capacity of no more than 5 gallons, listed or approved by a nationally recognized independent testing laboratory. Paragraph (f)(1) of this section reiterates the 5-gallon capacity limitation, and paragraph (f)(2) requires that safety cans be equipped with a flexible or rigid tubular nozzle attached to a valved spout. Paragraph (f)(3) requires that safety cans be provided with a vent valve designed to open and close simultaneously and automatically with the opening and closing of the pouring valve. Finally, paragraph (f)(4) requires that safety cans be designed so that they will safely relieve internal pressure when exposed to fire. These requirements will reduce the likelihood of diesel fuel spills and afford appropriate protection for miners, in response to commenters who were concerned about the use of safety cans to store and transport diesel fuel.

Section 75.1905 Dispensing of Diesel Fuel

This section addresses the dispensing of diesel fuel, and has been revised from the proposal to clarify the various ways that diesel fuel may be safely dispensed. Paragraph (a) provides that diesel-powered equipment may be refueled only from safety cans, from tanks on diesel fuel transportation units, or from stationary tanks. These requirements are intended to control the circumstances under which diesel fuel is dispensed underground, minimizing the opportunities for spills or leakage, and in response to commenters who expressed concern about fuel spillage underground.

Paragraph (b) contains requirements for the dispensing of diesel fuel from tanks, except for the dispensing of fuel from safety cans. Design specifications for safety cans are included in § 75.1904(f) of the final rule, which requires nozzles, spouts, and vent valves on safety cans.

The requirements of paragraph (b)(1) apply when gravity feed is used as a means of dispensing diesel fuel. Although in developing the proposed rule MSHA contemplated that gravity feed would be used as a method for dispensing fuel, the proposal did not specifically refer to it. Some commenters questioned whether this omission should be interpreted as a prohibition of gravity feed fuel dispensing. In response to these comments, MSHA has clarified that gravity feed is a permissible method of dispensing fuel. However, because gravity feed presents the same potential as a powered pump for a loss of fuel from an unattended hose, the final rule prohibits a latch-open device when gravity feed is the method of dispensing.

Paragraph (b)(2) is identical to the proposal and requires that a manual pump used to dispense diesel fuel have a hose equipped with a nozzle containing a self-closing valve. No comments were received on this aspect of the proposal, and it has been adopted unchanged.

Paragraphs (b)(3) (i) through (iii) require that, when a powered pump is used to dispense fuel, it be equipped with an accessible emergency shutoff switch for each nozzle, and that the hose be equipped with a self-closing valve without a latch-open device, and with an anti-siphoning device. These requirements have been adopted, with some minor changes, from the proposal. Specifically, the final rule clarifies that an accessible emergency shutoff switch be provided for ''each nozzle'', and adds a requirement for an anti-siphoning device. These modifications recognize that fuel piping systems may be installed underground that do not transport fuel from the surface, but from one location to another in the mine itself. These additional requirements are intended to prevent the leakage or pumping of the contents of a tank into the mine in the event of a broken or leaking pipe or hose. An accessible emergency shutoff switch is required for each nozzle under the final rule to permit quick action by mine personnel in the case of a leaking pipe or hose or in the event of fire during refueling. An anti-siphoning device prevents the inadvertent siphoning of fuel from a tank connected to the piping system, and is responsive to commenters' concerns regarding the hazards of fuel leaks and spills underground.

Commenters recommended that an inline fuse be required as near as possible to the pump's power source to deenergize the electrical system in the event of an electrical short circuit. This comment has not been adopted in the final rule, because the circuit protection specified in existing § 75.518 is sufficient to prevent or detect a short circuit. In addition, other existing electrical safety requirements in part 75 apply to electrical components associated with diesel fuel handling and storage, and provide adequate protection from electrical hazards.

Paragraph (c) prohibits the use of compressed gas in dispensing diesel fuel. This prohibition is identical to what was proposed and received no comments. The use of compressed gas to dispense diesel fuel would require not only a special tank but also an emergency venting system for pressurized tanks, and would still present a hazard. If a leak developed in the pressurized tank or its associated piping, relatively large amount of fuel could be spilled onto the mine floor, creating a serious fire hazard. This prohibition has therefore been retained in the final rule.

Paragraph (d), like the proposal, prohibits diesel fuel from being dispensed to the fuel tank of diesel-powered equipment while the equipment engine is running. This prohibition is derived from MSHA's review of Canadian fire accident data, which reveals that 10 fires occurred during refueling. Failure to shut off the engine may have contributed to these fires. This prohibition is also consistent with § 75.1916(d) of the final rule, which forbids unnecessary engine idling, and reduces exposure of miners to exhaust emissions.

Several commenters recommended that permissible diesel equipment be excluded from this prohibition because it is designed to be explosion-proof. These commenters also stated that shutting down the equipment should be avoided because of the difficulty in restarting it, and that in some cases a trained mechanic would be needed to restart the engine.

MSHA does not agree that permissible equipment should be excluded from this requirement. Although permissible diesel equipment is equipped with engine surface temperature controls that would prevent the ignition of diesel fuel if it is spilled on the equipment, air quality considerations support the adoption of this requirement for permissible as well as nonpermissible equipment. Not shutting down a machine engine during refueling serves no purpose other than convenience, and the diesel exhaust produced contributes unnecessarily to contaminant levels. The fact that engines may be difficult to restart does not justify exempting permissible equipment from this requirement. Equipment that is difficult to restart is in need of service or repair. The final rule therefore does not exempt permissible equipment from the prohibition against refueling of diesel equipment while the equipment engine is running.

Paragraph (e), which requires that powered pumps be shut off when fuel is not being dispensed, has been added to the final rule to address concerns about loss of fuel as a result of broken or leaking pipes. This requirement is intended to minimize the likelihood of fuel spills in the underground mine environment.

Section 75.1905–1 Diesel Fuel Piping Systems

Section 75.1905–1 has been added to the final rule to address requirements for diesel fuel piping systems. The requirements in the proposal governing fuel piping systems were included in the same section as proposed requirements for fuel transfer. MSHA has concluded that dispensing requirements and design and construction requirements for piping systems are sufficiently unique that they are more appropriately addressed in a separate standard.

Underground fuel piping systems can be very complex and may require specialized expertise for their design and installation. Mine operators should ensure that an engineering evaluation, including a fault analysis, is performed in developing a fuel piping system.

One commenter recommended that piping of diesel fuel should be allowed only in shaft mines, from the surface vertically to permanent underground

storage areas, and that the piping should be contained in its own borehole to isolate it from ignition sources. Safety considerations do not warrant restricting fuel piping systems to shaft mines. MSHA and industry experience, including an analysis of accident reports, does not reveal any increased hazard with the use of piping systems in slope mines. In the final rule, MSHA has removed the reference to vertical pipelines to clarify that this section applies to all mines.

Paragraph (a) of this section of the final rule adopts the proposed requirement that diesel fuel piping systems from the surface to be designed and operated as dry systems, unless an automatic shutdown is incorporated that prevents accidental loss or spillage of fuel and that activates an alarm system. The phrase ''from the surface'' has been added to the final rule to clarify that only piping systems from the surface are governed by the requirements of this paragraph. MSHA is aware that some mines have installed horizontal piping systems that do not originate at the surface. Because these horizontal systems typically cannot be operated as dry systems, the rule specifies that these systems would not be affected by this requirement. No location is specified for the alarm in the final rule, to allow mine operators flexibility in determining where the alarm will be most effective in alerting mine personnel.

Compliance with the requirement of this paragraph mandates a well designed piping system, and may require a double wall system. Except for the comment suggesting that piping of diesel fuel underground be limited to shaft mines, MSHA received no other comments on this provision, and the proposed requirement has been adopted in the final rule without change.

Paragraphs (b)(1) through (b)(4) address requirements for piping, valves, and fittings. These requirements are unchanged from the proposal, and constitute generally accepted design specifications. This standard requires that all piping, valves, and fittings be: (1) Capable of withstanding working pressures and stresses; (2) capable of withstanding four times the static pressure; (3) compatible with diesel fuel; and (4) maintained in a manner which prevents leakage.

Paragraph (c) requires pipelines to have manual shutoff valves installed at the surface filling point, and at the underground discharge point. This requirement is the same as the proposal, except that the proposal used the term ''vertical'' to describe pipelines. For the reasons discussed in the introduction to this section, the term ''vertical'' has been eliminated to clarify that this section applies to all underground coal mines.

Paragraphs (d) and (e), like the proposal, include requirements for shutoff valves on fuel lines. Paragraph (d) provides that if fuel lines are not buried in the ground, shutoff valves must be located every 300 feet. Paragraph (e) requires that shutoff valves be installed at each branch line where the branch line joins the main line. One commenter recommended that automatic shutoff valves be required in these two situations, stating that they provide for minimal loss of fuel and maximum safety in the case of a pipeline rupture or leak. MSHA does not believe that automatic shutoff valves are necessary when the additional benefits are balanced with other provisions in this final rule. The commenter's suggestion has therefore not been adopted in the final rule.

Paragraph (f) is a new provision in the final rule and requires that an automatic means be provided to prevent unintentional transfer of fuel from the surface into the permanent underground diesel fuel storage facility. This requirement has been added to address the concerns of some commenters that were prompted by a specific diesel fuel spill caused by malfunctioning components in a diesel fuel piping system. Additionally, many commenters were generally concerned about possible fire and other hazards that could result from diesel fuel spills and leaks, particularly when piping systems are used. This paragraph responds to those comments by requiring a fail-safe piping system, ensuring that necessary protection is provided to miners.

Paragraph (g) provides that diesel fuel piping systems from the surface can only be used to transport fuel directly to stationary tanks or diesel fuel transportation units in a permanent underground diesel fuel storage facility. This requirement has been renumbered and has been revised from the proposal to respond to commenters who recommended strict control of the use of safety cans and stated that dispensing fuel from a piping system directly into diesel equipment fuel tanks would create a fire hazard. This paragraph is intended to prohibit filling safety cans and equipment fuel tanks directly from a piping system and further minimize hazards associated with fuel spills.

Under this paragraph a fuel piping system from the surface may terminate underground only in a permanent fuel storage facility, which must be equipped with features such as a fire suppression system and a means of containing a fuel spill. Because temporary fuel storage areas are not required to have these features, they would not provide adequate fire protection for a situation where a significant amount of fuel is lost in a spill from a piping system.

Paragraph (h), like the proposal, requires that when boreholes are used the diesel fuel piping system cannot be located in a borehole with electric power cables. This will minimize the likelihood of fire by diesel fuel coming into contact with potential ignition sources.

Paragraph (i) requires that diesel fuel piping systems located in entries not be located on the same side of the entry as electric cables or power lines. It also requires that guarding be provided when piping systems cross electric cables or power lines. The final rule has been modified from the proposal to acknowledge that, in some cases, a pipeline must cross over power lines, depending upon the mine's layout. The standard addresses any hazards presented by the intersection of pipelines and electric cables or power lines by requiring that guarding be provided.

Paragraph (j) requires that piping systems be protected to prevent physical damage. Commenters supported this provision, and it is unchanged from the proposal.

Section 75.1906 Transport of Diesel Fuel

This section of the final rule has been retitled and reorganized to reflect MSHA's approach to diesel fuel storage and handling in this final rule. The word ''containers'' is removed from the title to reflect that only two types of vessels are allowed to transport and dispense diesel fuel—safety cans and tanks. This section of the final rule is responsive to commenters who: expressed concerns about the wide and uncontrolled use of safety cans in underground coal mines; recommended limited section storage of diesel fuel; stated that fire suppression systems were not needed on the tank used to transport fuel; and noted the need for clarification of the requirement for portable fire extinguishers on diesel fuel transportation units.

Several commenters stated that the proposed rule was vague and confusing. Their comments were directed to the use of the terms ''containers,'' ''safety cans,'' ''tanks,'' and ''fuel transportation units.'' As indicated in the preamble discussion for § 75.1900, MSHA has included definitions in the final rule for the terms ''safety cans,'' ''diesel fuel tank,'' and ''diesel fuel transportation unit'' to provide additional clarification

for the fuel handling and storage requirements in the final rule. The term ''container'' has not been defined because it has been eliminated from the final rule.

Several commenters recommended that the use of small containers and cans be restricted because they are prone to leak when transported or used to dispense fuel. In support of their recommendation, these commenters cited instances of mine floors being saturated with fuel. Other commenters urged that safety cans be allowed for transport of small quantities of diesel fuel, and stated that prohibiting their use would be unwarranted. As stated earlier in the discussion for this section, the final rule has been revised to require that safety cans be listed or approved by a nationally recognized independent testing laboratory. This aspect of the final rule will provide miners with protection against leakage and spillage during dispensing operations, while recognizing the practical need to transport small quantities of diesel fuel.

Paragraph (a) of this section of the final rule requires diesel fuel to be transported only by diesel fuel transportation units or in safety cans. This requirement is intended to ensure that diesel fuel is transported only in vessels designed for that purpose. The proposal would have required diesel fuel to be transported in specially designed containers. A commenter recommended substituting the term ''combustible liquid'' in place of the term ''diesel fuel'', stating that there are Department of Transportation specifications for containers that transport combustible liquids. The final rule responds to commenters by limiting the transport of diesel fuel to safety cans, which must be listed or approved by a nationally recognized independent testing laboratory, or by diesel fuel transportation units, which must be equipped with a tank designed for the transport of diesel fuel.

MSHA recognizes that safety can use must be carefully controlled. Paragraph (b) of this section of the final rule allows only one safety can to be transported on a vehicle at any time, and the can must be protected from damage during transport. All other safety cans must be stored in permanent underground fuel storage facilities. This provision is revised from the proposal to be responsive to commenters who cited problems with misuse of small cans and recommended that they be strictly controlled. Commenters further stated that in some mines there was no designated area for storage of safety cans. The requirements that have been added to the final rule are intended to ensure safe transport of safety cans. The final rule does not require that single safety cans, which are secured and protected on a vehicle, be removed for storage in permanent facilities when the vehicle is left unattended. This aspect of the final rule will allow for emergency refueling, while at the same time provide a degree of control over the use of safety cans.

Paragraphs (c) and (d) require that leaking safety cans be promptly removed from the mine, and that safety cans and tanks on diesel fuel transportation units be conspicuously marked. These marking requirements are consistent with marking requirements for permanent fuel storage facilities and temporary fuel storage areas in § 75.1903(b)(3) of the final rule. The inclusion of marking requirements for safety cans and tanks in the final rule is responsive to several commenters who suggested that signs should be placed on mobile equipment identifying tanks and cans used for diesel fuel storage. This is also a prudent fire protection practice.

Paragraphs (e) and (f) establish requirements for the transportation of tanks on fuel transportation units. As mentioned earlier, the final rule does not use the term ''container''. Paragraph (e) provides that diesel fuel transportation units must not transport more than 500 gallons of diesel fuel at one time. Paragraph (f) requires tanks on diesel fuel transportation units to be permanently fixed to the units and have a total capacity of no greater than 500 gallons. Under the proposal, containers used for the transport of diesel fuel could not exceed a capacity of 500 gallons, and would have been required to be permanently fixed to the transportation unit. One commenter recommended that the maximum tank capacity be limited to 250 gallons, reasoning that less fuel would reduce the fire hazard. The interrelated precautions of the final rule are designed to protect against a fire involving a diesel fuel transportation unit. Reducing the unit's fuel capacity to 250 gallons would not add significantly to the protection against fire, and would increase the frequency with which the unit would need to be refilled. However, paragraph (e) is intended to limit the amount of fuel transported by a single trip, either on rails or rubber tires, to 500 gallons. Paragraph (f) will ensure that the fuel tank is not removed from the vehicle for transport separately, thereby exposing the tank to possible damage, and also offers some protection for the tank from the vehicle frame.

Paragraph (g) requires non-self-propelled diesel fuel transportation units equipped with electric components for dispensing fuel that are connected to a source of electrical power be provided with a fire suppression device that meets the requirements of existing §§ 75.1107–3 through 75.1107–6, §§ 75.1107–8, and § 75.1107–16. The proposed requirement would have required a fire suppression system meeting the requirements of proposed § 75.1911 on all diesel fuel transportation units, not only on those with electrical components.

Commenters were opposed to a requirement for fire suppression systems on all diesel fuel transportation units, stating that a trailer-mounted fuel tank did not need a fire suppression system since it had no ignition source, and should not be treated any differently than tanks transporting other combustible materials. These commenters believed that the fire extinguishers required under the proposal would provide adequate fire protection in temporary fuel storage areas.

MSHA agrees with commenters that fuel tanks alone, without an ignition source, do not present a significant fire hazard. However, fire protection for fuel tanks must be provided when a potential ignition source exists. An ignition source is present on the diesel fuel transportation unit when electrical power is provided to the dispensing pump on the unit from either an electric-powered machine or the mine electrical system. The final rule therefore requires fire protection for non-self-propelled diesel fuel transportation units with electrical components for dispensing fuel that are connected to a source of electrical power. Diesel fuel transportation units with electrical devices other than those used for dispensing fuel, such as lights, do not present a significant fire hazard and do not need to be protected by a fire suppression system. This fire suppression device requirement would also apply when the transportation unit's dispensing pump is powered by its own batteries or an off-board generator.

The final rule requires a fire suppression device meeting the requirements of existing § 75.1107, instead of § 75.1911 under the proposal, because the fire protection provided by § 75.1107 is suitable for electrical installations, and therefore appropriate for electrical components of fuel transportation units. A fire suppression system under § 75.1911 is designed to protect diesel-powered equipment, and,

unlike existing § 75.1107, does not require that the mine electric power supply to the fuel transportation unit be shut off when the fire suppression system is actuated, an important safety feature that prevents reignition of the fire.

Paragraph (h) requires diesel fuel transportation units and vehicles transporting safety cans to have at least two multipurpose, dry chemical type (ABC) fire extinguishers. The fire extinguishers must be listed or approved by a nationally recognized independent testing laboratory, and have a 10A:60B:C or higher rating. There must be at least one fire extinguisher located on each side of the vehicle. The proposal would have required that fire extinguishers be provided on each end of a fuel transportation unit when diesel fuel was transported in containers other than safety cans. Locating fire extinguishers on the side is consistent with the requirements of § 75.1911(e) of the final rule for the location of fire suppression system actuators. The type and size of extinguisher are the same as required by § 75.1903(b)(1) and (b)(2) for permanent underground diesel fuel storage facilities and temporary underground diesel fuel storage areas.

Paragraph (i) requires that diesel fuel transportation units be parked in permanent underground diesel fuel storage facilities or temporary underground fuel storage areas when not in use. Under the proposal, ''unattended'' diesel fuel transportation units would have been required to be parked only in fixed or mobile fuel storage facilities. Some commenters objected to this requirement, and urged MSHA to provide a more workable rule that would allow transportation units to be parked, consistent with the Advisory Committee's recommendation that MSHA establish requirements for the temporary parking of diesel transportation vehicles. Some commenters also stated that ''unattended'' was an ambiguous term.

The term ''unattended'' has been eliminated from the final rule. Instead, the final rule provides that diesel fuel transportation units that are ''not in use'' must be parked either in permanent storage facilities or temporary storage areas. The phrase ''not in use'' means that the unit is not being trammed or used to dispense fuel or lubricants or waiting to refuel another piece of equipment. It does not mean that the unit operator must be within 500 feet or within the line of sight of the fuel transportation unit, as long as the operator is performing an activity associated with the operation of the unit. This may occur, for example, while the operator is locating the next unit of equipment to be refueled. This requirement is intended to control the locations of diesel fuel transportation units to minimize fire hazards associated with their use.

Paragraph (j), like the proposal, applies the requirements of existing § 75.1003–2 when the distance between a diesel fuel transportation unit and an energized trolley wire at any location is less than 12 inches. Section 75.1003–2 sets forth specific precautions to be followed when off-track equipment is being moved in areas where energized trolley wires are present. MSHA received no comments on this aspect of the proposal and it has been adopted into the final rule unchanged. This requirement is intended to minimize the risk of ignition and fire when a diesel fuel transportation unit is in close proximity to a bare energized trolley wire. The sparks and heat from an electrical short circuit could ignite residual fuel on the transportation unit and fire may then spread to the larger volume of fuel stored on the transportation unit.

Paragraph (k) prohibits the transport of diesel fuel on or with mantrips, or on conveyor belts. This requirement has been revised from the proposal, which would have prohibited transport of diesel fuel on conveyor belts, to include within the prohibition the transport of diesel fuel on mantrips, in response to several commenters who expressed concern about transportation of diesel fuel on personnel carriers because of the inherent hazards associated with that practice. This requirement applies to equipment being used as personnel carriers, but does not apply to such equipment when it is used for purposes other than transporting miners in the mine. This requirement also does not apply to diesel fuel contained in the fuel tank of a diesel-powered personnel carrier.

Paragraph (l) requires that, as of 12 months after the publication date of the final rule, diesel fuel must be stored and handled in accordance with the requirements of §§ 75.1902 through 75.1906 of this part. Twelve months will provide sufficient time for mine operators to make any necessary changes to their fuel handling, transportation, and storage practices underground, such as fuel tank retrofits or construction of fuel storage facilities. The requirements of § 75.1903 (c) and (d) take effect sooner, because they address safe welding practices in or near diesel fuel storage areas, and mine operators should not need any additional time to come into compliance with these provisions.

Section 75.1907 Diesel-Powered Equipment Intended For Use In Underground Coal Mines.

This section establishes a schedule for compliance with the final rule's equipment-related requirements, including requirements for approved engines and power packages, fire suppression systems, and safety-related requirements for nonpermissible equipment in §§ 75.1909 and 75.1910. The concept of a time schedule to allow for conversion or replacement of diesel-powered equipment currently in use to comply with the new requirements of the final rule was recommended by the Diesel Advisory Committee. The Committee also recommended that equipment newly introduced underground after a fixed date meet the new requirements.

Under the compliance schedule of this section, 30 days after the rule's publication date all diesel-powered equipment used where permissible electric equipment is required must be approved under part 36. This section also establishes a compliance schedule for Part 36-approved equipment, to comply with certain surface temperature limits within 6 months, and be provided with a fire suppression system and brakes that meet certain standards within 36 months of the rule's publication. Part 36-approved equipment is also required to have a particulate index and a dilution air quantity determined under subpart E of part 7 within 12 months of the rule's publication date. Permissible diesel-powered equipment that is manufactured 3 years after the date of publication of the final rule or later and used in underground coal mines must incorporate a power package approved under subpart F of part 7 of the final rule. This section of the final rule also requires nonpermissible diesel-powered equipment, with the exception of the special category of ambulances and firefighting equipment under § 75.1908(d), to be equipped with the machine safety features set forth in §§ 75.1909 and 75.1910 within 36 months of the publication date of the final rule.

The overall approach taken in the final rule for equipment safety features is different from that of the proposal, in response to commenters and for reasons explained in detail in the preamble for parts 7 and 36. The proposed rule would have required approval of fully assembled permissible equipment under subpart H of part 7, and approval of fully assembled nonpermissible

equipment under subpart I of part 7. A limited class of light-duty nonpermissible equipment would have been established that did not require fully assembled machine approval, but which would have been equipped with specific machine safety features set forth as mandatory standards in proposed § 75.1909. Under proposed § 75.1907, specific deadlines, up to 60 months after the rule's effective date, would have been set for compliance with the equipment-related requirements of the final rule for both permissible and nonpermissible equipment, including limited class and stationary unattended equipment. Additionally, the proposal would have allowed a mine operator to apply for MSHA approval for continued use of diesel-powered locomotives without required subpart F or G power packages. MSHA would have been authorized to grant such approval if approved power packages suitable for specific mine conditions and locomotive design were not available, recognizing that the current state of technology might make compliance difficult or impossible.

The proposed rule took the approach of phasing in the different equipment-related requirements, depending on how long MSHA determined mine operators and manufacturers would need to obtain the necessary equipment or make the necessary retrofits, including time needed to obtain MSHA approval for the appropriate machine components. Specifically, the proposed rule would have allowed a longer period of time for equipment to be provided with approved engines and power packages than it would have allowed for other equipment-related requirements, for such features as brakes, fuel systems, and electrical components. Different time frames would have been allowed under the proposal to take into account the time needed for the MSHA approval process as well as the technical difficulties associated with retrofitting equipment with approved power packages and engines.

As discussed in the preamble to part 7 of the final rule, the final rule does not adopt the approach of fully assembled machine approval under subparts H and I of part 7 contemplated by the proposal and addressed in the concurrent advance notice of proposed rulemaking. Instead, part 36 has been expanded to specifically provide for approval of diesel-powered equipment used in areas of underground coal mines where permissible electric equipment is required. Fully assembled machine approval is not required under the final rule for any category of nonpermissible equipment. The compliance time frames of this section of the final rule reflect this change in approach.

The time frames in this section are based on an estimation of the useful life of existing diesel-powered equipment, the reasonable time needed to convert or retrofit existing equipment, and the commercial availability of suitable replacement equipment. The time frames in this section are intended to provide mine operators with a reasonable period of time to make determinations of the expected remaining useful life of diesel-powered machines in use in their mines and the cost of necessary machine modifications, and to compare this information with the replacement cost of equipment that complies with the requirements of the final rule.

One commenter rebuilt a diesel-powered truck to convert it to a personnel carrier that met the equipment safety requirements of the proposed rule for self-propelled limited class nonpermissible equipment, and submitted a written summary documenting the conversion into the rulemaking record. This information generally demonstrated that compliance would be facilitated if equipment-related requirements were phased in by equipment type, rather than phasing in specific requirements across all equipment types. In short, once an equipment rebuild is initiated, it is easier to perform all machine feature modifications at the same time.

One commenter asserted generally that mine operators and equipment manufacturers could bring diesel-powered equipment into compliance with the requirements of the final rule within 12 months. Although MSHA agrees, and the final rule reflects, that some requirements can be met within a year, compliance with other requirements, will reasonably involve more time.

As explained in greater detail elsewhere in the preamble, the final rule requires specific safety features on both permissible and nonpermissible diesel-powered equipment. These requirements apply to nonpermissible diesel-powered equipment in §§ 75.1909 and 75.1910, and will be applied to permissible diesel-powered equipment during the MSHA approval process under part 36.

The final rule does not require nonpermissible equipment to be provided with power packages, which would have been required under the proposal. Neither does it require fully assembled machine approval for nonpermissible equipment. Power packages would have provided this equipment with, among other things, surface temperature controls for the equipment. As discussed elsewhere in the preamble, commenters were divided on this issue. Some commenters believed not only that temperature controls were necessary to adequately address the fire hazards presented by diesel-powered equipment underground, but also recommended that all diesel-powered equipment be approved under part 36 as permissible, and provided with the explosion-proof features required on such equipment. Other commenters strenuously opposed a requirement for approved power packages on nonpermissible equipment, stating that surface temperature controls were not needed on equipment operated outby the face, and that fire protection features, such as fire suppression systems, in conjunction with other machine safety features would provide an appropriate margin of safety. These commenters stated that a power package requirement for nonpermissible equipment would have the effect of eliminating many useful pieces of equipment from mines that could not be retrofitted with power packages or would not be manufactured with them.

The final rule does not require approved power packages on outby equipment, except when the equipment discharges its exhaust directly into a return air course, as provided under § 75.1909. Proposed subpart G, which would have established an approval program for power packages for nonpermissible equipment, has not been adopted in the final rule. Instead, nonpermissible equipment is required under § 75.1909(a)(10) to be provided with a means to prevent the spray from ruptured hydraulic or lubricating oil lines from being ignited by contact with engine exhaust system component surfaces. This requirement recognizes that the hazards of high surface temperatures on diesel-powered equipment can be controlled in a number of ways in addition to the methods contemplated under proposed subpart G. MSHA has concluded that the requirement of paragraph (a)(10), along with the other safety features required for control of fuel sources on diesel-powered equipment, provides effective fire prevention on nonpermissible diesel-powered equipment. The approach of the final rule allows mine operators and manufacturers the flexibility to improve existing methods and to develop new methods of meeting the performance goals of the final rule requirements.

Paragraph (a) of this section of the final rule adopts the proposed requirement that within 30 days of the date of publication of the final rule, all

diesel-powered equipment used where permissible electrical equipment is required be approved under part 36. Part 36 approval ensures that the equipment is explosion-proof, and that equipment used in areas of the mine where methane is likely to accumulate and where there may be combustible quantities of coal dust and other materials will not cause a fire or an explosion. All underground coal mines using diesel equipment already have the approved equipment necessary to comply with this requirement, in most cases because the mine's ventilation plan specifically requires it. This requirement therefore goes into effect 30 days after publication of the final rule, providing necessary protections for miners working underground.

Paragraph (b) establishes a time schedule under which equipment approved under part 36 is required to be provided with additional safety features. Paragraph (b)(1) requires the equipment to be provided with a safety component system that limits surface temperatures to those specified in subpart F of part 7. This requirement is essentially identical to that of the proposal, which would have required that part 36-approved equipment be provided with a power package that limits surface temperatures to those specified in subpart F. In the final rule, the equipment is required to have a ''safety component system'' that limits the surface temperatures rather than a ''power package'' specified under the proposal. Existing permissible equipment has been approved under the current version of part 36, which uses the term ''safety component system'' to refer to those devices added to the engine to control surface temperatures of the exhaust system. The term ''power package'' used in the final rule includes those devices, which, with the engine, comprises the ''power package.'' Power packages are approved under subpart F of part 7 of the final rule. As discussed elsewhere in this preamble, part 36 has been specifically revised to provide for approval of diesel-powered machines used in underground coal mines. Part 36 now references subparts E and F of part 7 of the final rule, and requires equipment approved under part 36 for use in coal mines to be equipped with a power package approved under subpart F. Subpart F limits the maximum surface temperature to less than 302° F (150° C). Until promulgation of this final rule, the maximum surface temperature of the engine and exhaust system components under part 36 was 400° F (204° C). To date, only one engine and safety component system used in part 36-approved equipment has a surface temperature above 302° F, and the equipment on which the system is installed is not used in coal mines. Consequently, compliance with this requirement within six months of the publication of the final rule should present no compliance difficulties for mine operators or manufacturers. This requirement will ensure that permissible equipment in underground coal mines will have surface temperatures below 302° F, minimizing the chance that combustibles such as diesel fuel, float coal dust, and hydraulic fluid will be ignited by high surface temperatures.

Paragraph (b)(2) requires that, as of 36 months after the final rule is published, equipment approved under part 36 be provided with an automatic or manual fire suppression system that meets the requirements of § 75.1911, and be provided with a portable fire extinguisher. A fire suppression system is required on permissible equipment in addition to surface temperature controls to address fire hazards created by other machine system malfunctions. The fire suppression system on permissible equipment may be either manual or automatic. Under the proposal, part 36-approved equipment would have been required to have a fire suppression system that met the requirements of § 75.1911. The requirements of proposed § 75.1911 provided only for automatic fire suppressions systems. For reasons explained in greater detail in the preamble discussion to § 75.1911, automatic fire suppression is not required on permissible diesel-powered equipment. This is because all equipment approved under part 36 is provided with surface temperature controls, which reduce the risk of fire. The final rule includes the additional requirement that the equipment be provided with at least one portable multipurpose dry chemical type ABC fire extinguisher having a 10A:60B:C rating or higher. The fire extinguisher must be located within easy reach of the equipment operator and be protected from damage by collision. This requirement has been added in response to the recommendation of a commenter. MSHA has concluded that requiring equipment to be provided with a portable fire extinguisher is a good fire prevention practice, and this recommendation has therefore been adopted in the final rule, superseding the requirement in part 36 for a fire extinguisher with a much lower firefighting rating. This requirement is consistent with the fire extinguisher requirements for nonpermissible equipment in the final rule.

MSHA had proposed a 6-month compliance deadline for installation of fire suppression systems on part 36-approved equipment, but has concluded that a 36-month time frame is needed for mine operators to obtain MSHA approval of field modifications on approved equipment, and for equipment manufacturers to process approval applications to permit installation of fire suppression systems on permissible equipment. The Agency intends to promptly process approval applications for modification of machines to aid compliance with this requirement.

Paragraph (b)(3) has been added to the final rule to require that, as of 36 months after the publication date of the final rule, equipment approved under part 36 be provided with brake systems that meet the requirements of § 75.1909(b)(7), (b)(8), (b)(9), (c), (d), and (e). These brake requirements have been added to ensure that permissible equipment meets at least the same braking requirements as nonpermissible equipment under the final rule. All existing part 36 equipment is already equipped with service brake systems that meet the requirements of § 75.1909(b)(8), (b)(9), and (d). The requirements of § 75.1909(c) have been developed from requirements for automatic emergency parking brakes on electric equipment in § 75.523–3. A number of commenters supported the application of these requirements to diesel-powered equipment, and they have been applied to permissible equipment under the final rule. Some existing part 36-approved equipment will require minor modifications to comply with the requirements of § 75.1909(c). Section 75.1909(b)(7) essentially requires independent service brake systems for the front and rear wheels of vehicles. This is a well-recognized safety feature that is warranted for part 36-approved diesel-powered equipment as well as for nonpermissible equipment covered by § 75.1909. Although the majority of part 36-approved equipment is already provided with this feature, a limited number of machines will require modification. Because some mine operators will need to obtain field modifications and equipment manufacturers must obtain MSHA approval of design modifications, a 36-month compliance time is appropriate and is provided for in the final rule.

Section 75.1909 of the final rule requires that nonpermissible diesel-powered equipment be equipped with a supplemental brake system, which provides substantially the same features as would be provided by the automatic emergency parking brakes specified in

§ 75.523–3. Section 75.1909(e) requires setting of the supplemental brake system when the operator is not at the controls of the equipment, except during the movement of disabled equipment. Because part 36-approved equipment is provided with a supplemental brake system under the final rule, the requirement for setting of the supplemental brake has also been applied to this equipment.

Paragraph (b)(4) requires that equipment approved under part 36 have a particulate index and a dilution air quantity determined in accordance with part 7, subpart E within 12 months of the publication date of the final rule. The types of engines that are affected by this requirement are installed in permissible face equipment that is currently approved under part 36. Because of where and how this equipment is used, it significantly affects the air quality where miners work and travel. Diesel-powered face equipment includes haulage equipment and roof bolters, which are typically used in the confined environment in the production area of the face and operated almost continuously over the course of a shift. The contribution of diesel exhaust from this equipment into the mine atmosphere can be significant and can adversely affect the health conditions for miners working in and around the area where the equipment is being operated. Under new requirements in § 75.325 of the final rule, minimum ventilating air quantities are established for areas where diesel-powered equipment operates. These minimum quantities are derived from the approval plate ventilating air quantity for the equipment that is operating. Consequently, ventilating air quantities must be calculated for these engines so that the minimum air quantity requirements can be implemented. As mentioned elsewhere in this preamble, the particulate index will not be used to determine the minimum ventilating air quantity for the engine, but will be available for informational purposes.

There are only four engines models used in the majority of part 36-approved equipment used in underground coal mines. These engines are typically of older design, and it is uncertain whether the engine manufacturers will seek approval for their engine designs under subpart E of part 7. As a result, MSHA intends to determine dilution air quantities and particulate indices for these engines in accordance with part 7, subpart E, whether or not the manufacturers seek a subpart E approval for their engines. MSHA will make this information available to mine operators, which must be applied and implemented within 12 months of the date of the final rule's publication. This time frame is consistent with the 12-month effective date for compliance with the ventilation requirements of § 75.325(k) of the final rule that apply where diesel-powered equipment is operated.

Paragraph (b)(5) requires that permissible diesel-powered equipment that is manufactured 36 months or more after the publication date of the final rule and used in an underground coal mine incorporate a power package approved under part 7, subpart F. Under the proposal, only ''new'' diesel-powered equipment approved under subpart H or I or meeting the requirements of §§ 75.1909 and 1910 could be introduced into underground coal mines 60 months after the effective date of § 75.1907. This meant that both new permissible and nonpermissible equipment (that did not fall into the limited class or was not used as stationary unattended equipment) introduced in an underground coal mine after the deadline would have had to receive a full machine approval. One commenter recommended that the proposed 60-month delayed effective date be changed to 12 months. Another commenter suggested that the language be clarified to state that existing part 36 approvals remain valid.

The time frame for compliance has been reduced to 36 months in recognition of the fact that the final rule does not require full machine approval of all permissible and nonpermissible equipment, as contemplated by the proposal. Three years should be sufficient for equipment manufacturers to obtain approval for and incorporate subpart F power packages into the permissible diesel-powered equipment they manufacture. Part 36-approved equipment manufactured before the relevant date may continue to be used in accordance with its approval indefinitely.

Paragraph (c) requires nonpermissible diesel-powered equipment to comply with §§ 75.1909 and 75.1910 within 36 months of the publication date of the rule. Under the final rule nonpermissible equipment, which is used in areas where permissible electric equipment is not required, does not need full machine approval by MSHA. However, under § 75.1909(a)(1) nonpermissible equipment must be equipped with an engine approved under subpart E of part 7. The final rule did not adopt the proposed establishment of a limited class of nonpermissible light-duty equipment, for reasons explained in detail in the preamble to § 75.1908. Instead, the final rule establishes two categories of nonpermissible equipment, heavy-duty and light-duty. Under paragraph (c) of this section of the final rule, equipment in both categories must be provided with the safety features set forth in §§ 75.1909 and 75.1910. These features include engines approved under subpart E of part 7, fire suppression systems, brakes, and electrical protections. Several commenters stated that approved engines, power packages, or surface temperature controls are unnecessary for nonpermissible equipment, while other commenters considered surface temperature controls necessary.

The final rule's equipment safety requirements for nonpermissible diesel-powered equipment are intended to ensure that the equipment will not present a fire hazard and that gaseous diesel exhaust emissions and particulate emissions are addressed.

A compliance time of 24 months was proposed, and one commenter recommended a 12-month compliance time. The final rule allows 36 months for nonpermissible equipment to comply with the requirements of §§ 75.1909 and 75.1910. Included in these sections is a requirement that nonpermissible equipment be provided with an engine approved under subpart E of part 7. It is expected that this requirement will require the longest time period for compliance, as engine manufacturers must first obtain MSHA approval of appropriate engines. The 36-month time frame allows some models of nonpermissible equipment currently in use in underground coal mines to reach the end of its useful life and to be replaced with equipment that meets these requirements, rather than being retrofitted with a new engine and the other features required by §§ 75.1909 and 75.1910.

The final rule does not adopt the proposed provision allowing mine operators to seek MSHA approval for the extended use of diesel-powered locomotives because of the unavailability of approved power packages suitable for the mine conditions or for the locomotive's design. This provision recognized that certain types of diesel locomotives might not have been able to be retrofitted to meet all of the applicable equipment-related requirements. Because the final rule does not require approved power packages for nonpermissible equipment, a process for MSHA approval of extended use of nonpermissible locomotives without approved power packages is no longer

necessary, and has consequently not been adopted in the final rule.

Section 75.1908 Nonpermissible Diesel-Powered Equipment; Categories

This section of the final rule establishes three categories of nonpermissible diesel-powered equipment: heavy-duty equipment, which is defined as equipment that is used for such tasks as cutting or moving rock or coal, drilling or bolting, or moving longwall components; light-duty equipment, which includes any other nonpermissible equipment that is not heavy-duty; and a special category for ambulances and fire fighting equipment. Because nonpermissible equipment is used in areas of the mine where methane is not likely to accumulate, it is not required to be explosion-proof. However, all nonpermissible equipment, with the exception of ambulances and other emergency equipment described under paragraph (d), is required to have an engine approved under subpart E of part 7, which sets engine performance and exhaust emissions requirements.

The requirements that apply to nonpermissible equipment under the final rule vary according to the equipment's category. Most importantly, the equipment category determines which equipment safety features are required under §§ 75.1909 and 75.1910 of the final rule. One of the most important distinctions between heavy- and light-duty equipment under the final rule is that heavy-duty equipment is required to have an automatic fire suppression system under § 75.1909, while light-duty equipment may be provided with either a manual or automatic system. Additionally, heavy-duty nonpermissible equipment is subject to the weekly undiluted exhaust emissions test under § 75.1914(g) of the final rule, and must also be included in the air quantity calculation for multiple units of diesel-powered equipment under § 75.325(g). These provisions do not apply to light-duty equipment.

The final rule is a significant departure from the proposal, in response to a majority of commenters who were opposed to the proposed criteria for the equipment categories. The proposal would have established a special category of nonpermissible ''limited class'' equipment. Limited class equipment under the proposal would have been equipment weighing less than 6,000 pounds and equipped with an engine of less than 90 horsepower. Equipment with a hydraulic system could not be included in the limited class, although MSHA stated in the preamble to the proposal that this restriction was not intended to apply to hydraulic systems used in brake units or automotive-style power assist units. Additionally, the equipment engine could not be turbocharged. Portable equipment that fell into this class was limited to welders and compressors. The proposal also allowed altitude compensation devices to be used with limited class equipment.

Although limited class equipment under the proposal would have been required to have an engine approved under subpart E of part 7, the machine as a whole would not have been approved by MSHA. Instead, limited class equipment would have been required to be equipped with the safety features in proposed § 75.1909. All other nonpermissible equipment would have been required to have a subpart F or G approved ''power package,'' which would have included an approved engine with additional components to prevent the ignition of methane or combustible materials, such as surface temperature controls. Additionally, it was MSHA's intention, reflected in the advance notice of proposed rulemaking published with the proposal, to require whole machine approval of all nonpermissible equipment, except equipment that fell into the limited class defined under the proposal.

The equipment categories in the proposed rule were based upon the Diesel Advisory Committee recommendation that fire prevention features, including surface temperature controls and fire suppression systems, be required on all outby equipment. However, the Committee recognized that much of the light-duty equipment in use in mines was not specifically designed for mining and might not be available with surface temperature controls. The Committee therefore concluded that a limited class of light-duty equipment could be safely operated if it was equipped with fire prevention and protection features in lieu of surface temperature controls, such as fire suppression devices, reduction of the potential for fuels to contact hot surfaces, and reduction of potential ignition sources. Equipment in this limited class would be expected to operate on a light-duty cycle, and would not reach high temperatures or would reach high temperatures for a limited period of time, with a significantly reduced potential for fire.

Commenters expressed widely varying views on this aspect of the proposal. Most commenters supported the concept of a distinct class of equipment with less extensive safety requirements, but many stated that the criteria in the proposal for limited class equipment were unnecessarily restrictive, and that the class should be significantly broadened to include many more types of equipment, such as light-duty manned personnel and material haulage equipment. A number of commenters indicated that the equipment that they would consider light-duty equipment in their mines exceeded either the weight or horsepower restrictions of the proposal.

Other commenters were of the opinion that fire suppression systems were an acceptable substitute for surface temperature controls, and strongly supported a significant expansion of the equipment falling into the limited class and therefore not required to have a power package that would provide such controls. A number of commenters also indicated that much of the equipment currently in use in mines that did not fall into the proposed limited class would have to be replaced, because it would be impossible to retrofit the equipment to provide the required surface temperature controls. Other commenters were concerned that limitations based on existing equipment designs could discourage the development of new technology.

One commenter was generally opposed to the creation of a limited class that was not required to have surface temperature controls, because the commenter believed that this would present an unacceptable fire hazard. This commenter stated that heat sensors that triggered engine shutdown or fire suppression were not acceptable substitutes for surface temperature controls.

A number of commenters were opposed to the limitation on equipment weight, stating that weight had no relationship to the hazards presented by the equipment, and that the 6,000-pound restriction was arbitrary. One commenter stated that although weight in some cases could be an indicator of duty cycle and the potential for higher equipment operating temperatures and resulting fires, requirements for fire suppression and automatic engine shutdown when engine temperature reaches a specified limit would adequately address these concerns. Another commenter stated that most diesel equipment that exceeds 6,000 pounds is not used in heavy-duty applications such as coal production but is considered light-duty equipment.

Some commenters were particularly concerned about the safety impact of the weight limitation on railmounted equipment, pointing out that weight is needed to provide traction. These commenters stated that although some

rail-mounted equipment would fall below the proposed horsepower limitation, the weight of most rail-mounted equipment significantly exceeds 6,000 pounds, and that it would be neither practical nor feasible to modify existing outby track equipment to meet the proposed limited class criteria. Because of this concern, one commenter suggested that outby rail-mounted equipment be addressed in a separate category, without a weight restriction.

Several commenters also stated that the safety features that would be required on limited class equipment under proposed § 75.1909 would add to the vehicle weight, making the 6,000-pound restriction even more unrealistic in those commenters' opinion. One commenter estimated that equipment retrofits for safety features and for mine-worthiness would increase equipment weight by at least 50 percent. Another commenter suggested that the proposed weight limitation would result in overloading equipment units because of light construction. Some suggested that the weight limitation for limited class equipment be increased to 7,500 or 8,500 pounds; others recommended that the limit be increased to 14,000 to 15,000 pounds, to permit units to be manufactured with heavy steel to withstand collisions. One commenter recommended that the weight limitation be reduced to 4,000 pounds for self-propelled equipment.

A number of commenters were also opposed to the 90-horsepower limitation, stating that engine horsepower was no more an indication of whether equipment was heavy-duty or light-duty than was equipment weight. However, one commenter recommended that the limitation be reduced to less than 70 horsepower.

Commenters were also concerned about the prohibition against hydraulic systems on limited class equipment. Several commenters stated that there was no basis for excluding equipment with hydraulic systems from the limited class, except for the fact that hydraulic fluid could present a fire hazard. These commenters suggested that equipment with hydraulic systems that utilized fire-resistant hydraulic fluid should be permitted. Some of these commenters also suggested that equipment with hydraulic systems should be eligible for the limited class category if the equipment is equipped with a fire-suppression system. Other commenters stated that equipment with hydraulic systems had not been shown to be less safe than equipment without such systems. Some pointed out that hydraulic systems facilitate the handling of supplies and materials, making the job easier and safer. These commenters also believed that prohibiting hydraulic systems on limited class equipment would preclude other equipment features that enhance safety, such as power take-offs, automatic transmissions, and hydrostatic drive units.

Commenters were also opposed to the prohibition against turbocharged engines for limited class equipment. This restriction was included in the proposal because of the concern about the potential ignition of combustible materials on the hot exhaust system surfaces that are characteristic of turbocharged engines. Commenters stated that turbochargers have served as an effective means of yielding greater horsepower from smaller engines and should be allowed on limited class equipment, and that the exhaust components could be encased in protective insulating material to eliminate any fire hazard.

A number of commenters expressed concern that manufacturers of equipment that was not specifically designed for use in mines would not seek MSHA approval for their equipment because the share of the market for mining applications was too small to warrant the expense of developing power packages.

A number of commenters stated that inclusion of equipment in a limited class should depend on how the equipment is being used rather than on factors such as size and weight. Some of these commenters suggested that light-duty equipment include equipment that does not move rock, coal, or longwall shields. Other commenters advocated that all diesel-powered equipment, including limited class equipment, be designed to be explosion-proof and be approved by MSHA under part 7. These commenters felt that establishing a limited class of light-duty equipment would allow mine operators to use equipment with inferior means of fire prevention.

One commenter recommended that a determination of the equipment included in the limited class should be based on MSHA's evaluation of diesel equipment fire experience in other industries and in other countries as to which types of equipment do and do not pose a significant fire hazard. In response to this comment, MSHA acquired accident reports from the Ministry of Labor, Province of Ontario, Canada, containing detailed information of fires on diesel-powered equipment in underground mines in Ontario for the years 1984 through 1992. This information was carefully analyzed to determine which machine safety features and what type of equipment design are needed to prevent fires on diesel-powered equipment used in underground coal mines. An analysis of the Ontario fire data reveals that equipment used in heavy-duty type activities, such as hauling rock or coal or moving longwall components, presents a significant fire hazard and requires suitable fire prevention and protection features.

Consistent with these conclusions and also with the recommendations of a number of commenters, paragraphs (a)(1) through (a)(5) of this section of the final rule specify what constitutes heavy-duty equipment. Heavy-duty nonpermissible equipment includes equipment that cuts or moves rock or coal; equipment that performs drilling or bolting functions; equipment that moves longwall components; self-propelled diesel fuel transportation units and lube units; and machines used to transport portable fuel transportation units or lube units. These machines are intended to move rock or coal or other heavy loads, such as longwall components, or move large quantities of combustible diesel fuel as a normal part of their duty cycle. Locomotives used to transport rock or coal and portable diesel fuel transportation units or lube units would also be in the heavy-duty equipment category under the final rule. Graders would also be considered heavy-duty equipment, because they are used to move rock or coal.

Equipment falling within the heavy-duty equipment category under paragraph (a) is typically used for extended periods during a shift on a continuous, rather than intermittent, basis. This is in contrast to equipment that is used for limited periods during a shift, such as mantrips or supply vehicles. Heavy-duty equipment under the final rule also moves heavy loads or performs considerable work as in the case of drilling machines. Equipment used to haul longwall components is typically operated at a consistently accelerated pace under an extremely heavy load. Fuel transportation units and lube units generally are larger machines specially designed to transport and dispense diesel fuel, hydraulic fluid, grease, oil, and other combustible materials. This equipment also operates under a heavy load and typically moves constantly around a section during the course of a shift, refueling equipment as needed. Equipment that performs drilling and bolting functions generally has an engine that runs at a high rate of speed and powers large hydraulic systems. Under the final rule heavy-duty

equipment must be provided with an automatic fire suppression system, addressing the additional fire risks resulting from the way this equipment is used. Heavy-duty equipment also produces greater levels of gaseous contaminants, and under the final rule is therefore subject to weekly undiluted exhaust emissions tests under § 75.1914(g), and is included in the air quantity calculation for ventilation of diesel-powered equipment under § 75.325(g).

Under paragraph (b) light-duty equipment is defined as any other diesel-powered equipment that does not meet the criteria of paragraph (a). This is in contrast to the approach taken in the proposed rule establishing a limited class of light-duty equipment. Light-duty equipment under the final rule may include, but is not limited to, forklifts used to carry supplies, rock dusting machines, tractors not used to move rock or coal, supply trucks, water trucks, personnel carriers, jeeps, scooters, golf carts, and pickup trucks. The equipment may be rubber-tired, crawler-mounted, or rail-mounted.

Under the final rule two machines of the same model could fall into different equipment categories, depending on how they are used. For example, a load-haul-dump unit used to move rock or coal would be considered heavy-duty equipment, while an identical machine used exclusively to move supplies would be a light-duty machine, subject to different requirements. Although these machines are of the same design, they do not present the same risk of fire because of the way they are used. They also do not produce the same quantities of exhaust contaminants: machines that are operated for extended periods of time under heavy load generate more contaminants than machines that are not.

Equipment that is classified as light-duty may not be used, even intermittently, to perform the functions listed in paragraphs (a)(1) through (a)(5). This is because equipment that performs heavy-duty functions poses an increased fire risk, resulting in the need for an automatic fire suppression system, as required under § 75.1909 for heavy-duty equipment. On the other hand, heavy-duty equipment may be used to perform light-duty work.

The proposed restriction of portable limited class equipment to compressors and welders has not been adopted in the final rule. Although one commenter did support this restriction, most commenters were opposed to it, stating that it was arbitrary and unjustified as well as impractical. One commenter stated that the proposed restriction would require major replacement of diesel-powered portable equipment, either by electric-powered machines or by diesel equipment furnished with power packages. Other commenters suggested that attended diesel generators be added to the limited class because they presented safety concerns that were no greater than for welders and compressors.

In response to these comments, any type of attended portable diesel-powered equipment may be light-duty under the final rule, so long as it does not perform any of the functions listed in paragraph (a). As discussed more fully above, the distinction between light-duty and heavy-duty equipment has less significance under the final rule than it would have had under the proposal, since neither light-duty nor heavy-duty nonpermissible equipment will be required to have a surface temperature-controlled power package or be subject to fully assembled machine approval.

One commenter suggested that the term ''attended'' be defined in the final rule, and paragraph (c) specifies that attended diesel-powered equipment for purposes of subpart T includes: any machine or device that is operated by a miner; and any machine or device that is mounted in the direct line of sight of a job site located within 500 feet of such machine or device, which job site is occupied by a miner.

This definition of ''attended'' is largely derived from the definition of ''attended'' in existing § 75.1107–1 applicable to electric-powered equipment, although it has been tailored to address safety concerns unique to diesel-powered equipment, such as the fact that fires on diesel-powered equipment, unlike fires on electrical equipment, do not smolder for a very long time and therefore are less likely to be discovered before flaming and spreading. For this reason and unlike equipment under § 75.1107–1, attended equipment under paragraph (c) must be continuously attended while it is operating, regardless of whether it is during a production shift. Also unlike equipment under § 75.1107–1, attended equipment under paragraph (c) does not need to be attended by the person assigned to operate it. The definition of ''attended'' in this section permits prompt operator action in the event of a fault or fire on a diesel-powered machine. As discussed elsewhere in this preamble, the category of ''stationary unattended'' equipment has not been adopted in the final rule, and under § 75.1916(e) all diesel-powered equipment must be attended when operated.

Paragraph (d) establishes a special equipment category for diesel-powered ambulances and fire fighting equipment, which may be used underground only in accordance with the fire fighting and evacuation plan required under existing § 75.1101–23. This special category was included in the proposal under § 75.1907(b), but has been included in this section of the final rule with the other categories of nonpermissible equipment. Equipment that falls into this category is not required to have an approved engine or power package, or to comply with the requirements of §§ 75.1909 and 75.1910. Instead, such equipment must be used in accordance with the fire fighting and evacuation plan required under existing § 75.1101–23.

This provision was addressed by only a few commenters, who supported the establishment of a special class of diesel-powered equipment for emergency use, and has been adopted essentially unchanged from the proposal. The equipment under this paragraph may be used only during emergencies and the fire drills specified in the fire-fighting and evacuation plan. Very little equipment that is currently in use falls into this category. Mines that do have such equipment must provide MSHA with revised fire fighting and evacuation plans that adequately address the use of this equipment.

Sections 75.1909 and 1910 Design and Performance Requirements for Nonpermissible Diesel-Powered Equipment

Overview. Sections 75.1909 and 75.1910 of the final rule set forth the design and performance requirements that apply to nonpermissible diesel-powered equipment, except for the special category of emergency equipment established under § 75.1908(d) of the final rule. Section 75.1909 requires, among other things, nonpermissible diesel-powered equipment to be provided with engines approved under subpart F of part 7, fire suppression systems, fuel systems, and brakes. For ease of reference, electrical system requirements, which were proposed under § 75.1909, have been adopted in the final rule in § 75.1910.

As explained in greater detail in the preamble discussion for § 75.1908 of the final rule, the proposal would have established a ''limited class'' of light-duty equipment, which, although required to have an approved engine, was not otherwise subject to MSHA approval. Instead, limited class equipment would have been governed by the design and performance requirements set forth in proposed